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FINAL RESULTS IN RADIUM TREATMENT OF CARCINOMA OF THE CERVIX UTERI AT RADIUM HOME, STOCKHOLM, SWEDEN[1]

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IT is my purpose in this paper to report the results obtained at the Radium Home in Stockholm, Sweden, from the use of radium in the treatment of carcinoma of the cervix uteri. I shall discuss only the final results of our treatment and shall not dwell on the palliative effects. The latter are today generally recognized as better than those from any other methods of treatment, and for this reason hardly need be further illustrated.

I have limited my review to the period between 1914 and 1921, inclusive. The cases treated in 1922 and 1923 have been under observation too short a time to be of value in determining final results. The cases treated in 1910 to 1913 inclusive are also not presented here, because in these years great changes were being made in the technique of treatment in the Radium Home. Previous to 1914, Forssell gradually elaborated the technique, and at the end of 1913, he had it almost standardized. Since 1914, all our cases have been treated according to the same method in principle. Whereas almost all other clinics have changed their technique frequently, we have continued to use the same technique for 10 years. Our method of treatment, is, briefly, as follows:

We treat with radium salt. Three treatments are given: the second, 1 week after the first, the third, 3 weeks after the second. At each treatment radium is introduced into the uterine cavity and packed against the tumor surface in the vagina. In each treatment we use about the same amount of radium and the same length of time (22 hours). The sum of the three treatments is about 2,400 milligram element hours in the uterus, and 4,500 milligram element hours in the vagina. We use a heavy filtration, equivalent to 2 millimeters of lead in the uterus and 3 to 4 millimeters of lead in the vagina.

Radium treatment is repeated only on rare occasions. It is useless and dangerous to give further radium treatment to patients who do not improve after these three treatments. If a local recurrence occurs in a clinically healed tumor, hysterectomy is performed if the case is operable. If the case is inoperable, we make a very careful attempt with repeated radium treatment or with deep roentgen treatment. We have abandoned the combined use of the roentgen-ray and radium, since we have found that our results were not better, but rather worse than when we used radium only.

My report comprises only primarily radium-treated carcinomata of the cervix. Cases of carcinoma of the body of the uterus in which there were recurrences after radical operation and prophylactically irradiated postoperative cases are not included. All patients with carcinoma of the cervix are included, whether the treatment has been completed or not. The only cases which are not included in this re-

[1] Presented in the symposium on "Cancer" before the Clinical Congress of American College of Surgeons, New York, October 20–25, 1924.

port are those cases which we had to turn away because of limitation of space and radium at the Radium Home. These totaled 41, 7.5 per cent, of the total number applying for treatment. The cases which have been treated within the above mentioned 8 year period are 505 in number (Table II). Two-hundred and seventeen of these have been observed for at least 5 years after treatment was begun.

A thorough and minutely organized control of the patients has made it possible for us not to lose sight of a single patient during all these years. Thus we can report on 100 per cent of the cases treated. To a great extent this is due to the fact that the Swedish Government, by an act of Parliament, pays the traveling expenses of poor patients to and from the Radium Home.

Our classification of the cases into operable and inoperable is the same as is used in surgical statistics; cases with involvement of either the glands, the bladder, or the rectal wall, or cases in which the tumor is fixed by involvement of the parametrium are considered as inoperable. If the tumor is movable and there is no involvement of the bladder, rectum, or glands, the case is counted as operable, whether or not the parametrium or the vagina is involved. Our operable cases seem to correspond to Group I and II, in Dr. Greenough's classification, the borderline case to Group III, and the inoperable cases to Group IV. During the first 5 years embraced in this report, only exceptionally did we treat any but inoperable cases, and of the operable cases we treated only those in which a radical operation was considered contra-indicated. The chief reason for the procedure was that Forssell on repeated occasions during this period stated that one should first of all obtain sufficient experience with the radium treatment in the inoperable cases and those localized cases in which an operation was contra-indicated. The radium treatment was to be extended to the operable cases only when the results justified such a procedure.

Between 1919 and 1920 the Radium Home was able to present a report on its first results after a period of observation of 4 to 5 years. In these papers I gave an account of 66 cases, 33.3 per cent of which were clinically healed 4 to 5 years after the beginning of the treatment. Our results were considered such a strong argument in favor of the radium treatment that surgeons and gynecologists of Sweden began more and more to restrict the operative therapy. About 1920 our leading gynecologists gave up operating on carcinoma of the cervix uteri. As a consequence of this an ever-increasing number of operable cases were referred to the Radium Home for treatment during the following years. The inoperable cases are, however, still predominating. And as late as 1921 the inoperable and the borderline cases constituted 63.5 per cent. The proportion is illustrated in Table I, showing that the inoperable and borderline cases average 91.3 per cent in the first 5 year period, dropping to 76.3 per cent in 1919 and to 63.5 per cent in 1921. The borderline cases, here included, constituted 7.3 per cent of the total number of cases.

The ages of our 505 cases are shown in Table VI. In round numbers one-third were 45 years old or less, one-third were from 46 to 55, and one-third were more than 56.

Since 1915, when Forssell left the gynecological treatment entirely to me, I have made all after-examinations myself.

Table III shows the final results. The third column contains the number of cases which were clinically cured 5 years after the beginning of the treatment. Of a total of 217 cases treated in 1914 to 1918 inclusive, 44 (20.29 per cent) were clinically cured. Except in a small number of cases in the earliest years, all cases were microscopically examined. All patients that have died are counted as dead of cancer.

The 20.29 per cent of 5 year cures is in our opinion, hardly a correct representation of the results which we think can really be obtained by our method. From Table III you will see that the results of the year 1916 and 1917 are so much worse than those of the years 1914, 1915, and 1918 that the total result is materially affected. A close study of all factors which might have caused these poor results makes it probable that the main cause was failure to carry out our treatment in accordance with our principles because of too small a supply of radium. A further indication that

TABLE I.—PROPORTION OF CASES OF CARCINOMA OF THE CERVIX TO ALL INOPERABLE PLUS BORDERLINE CASES TREATED AT RADIUM HOME, 1914 TO 1921

Year	Per cent	Year	Per cent
1914	88.5	1918	87.8
1915	97.5	1919	76.3
1916	93.6	1920	68.1
1917	88.9	1921	63.5

TABLE II.—DISTRIBUTION OF CASES AND PERCENTAGE OF OPERABLE CASES (BORDERLINE CASES NOT INCLUDED) IN 505 CASES OF CARCINOMA OF THE CERVIX TREATED AT RADIUM HOME, 1914 TO 1921

Year	Number of cases	Percentage operable
1914	26	11.5
1915	40	2.5
1916	47	6.4
1917	63	11.1
1918	41	12.2
1919	76	23.77
1920	97	31.9
1921	115	36.5

TABLE III.—RESULT OF RADIUM TREATMENT IN 217 CASES OF CARCINOMA OF THE CERVIX. SYMPTOM-FREE 5 YEARS AFTER TREATMENT WAS BEGUN

No. cases treated	Year	No. cases symptom-free after 5 years	Percentage
26	1914	7	26.9
40	1915	13	32.5
47	1916	4	8.5
63	1917	9	14.3
41	1918	11	26.8
217		44	20.29

this opinion is correct is that the poor results were not repeated subsequently as shown in Table IV. In this table I have worked out the number of clinically cured cases in 1914, 1915, and 1918, 1 year, 1½ years, 2, 3, 4 and 5 years after the beginning of the treatment. Putting the results in 1919, 1920, and 1921 in corresponding columns, you will find that the results in these years are on a par with the good results obtained at a corresponding time in 1914, 1915, and 1918. Though surprises might, of course, occur, we hope that the results judged after 5 years will be similar.

For this reason we feel warranted in considering that the average figures of the 5 year result obtained by our method of treatment

TABLE IV.—RESULT OF RADIUM TREATMENT IN 505 CASES OF CARCINOMA OF THE CERVIX. NUMBER OF SYMPTOM-FREE CASES 1 TO 5 YEARS AFTER TREATMENT WAS BEGUN

After	1914 to 1918 Per cent	1919 Per cent	1920 Per cent	1921 Per cent
1 year	37.5–46.3			
1½ years	34.6–41.5			
2 years	34.6–36.0			39.1
3 years	30.8–32.5		30.9	
4 years	26.9–32.5	27.6		
5 years	26.8–32.5			

TABLE V.—RESULT OF RADIUM TREATMENT IN OPERABLE CASES (BORDERLINE CASES INCLUDED) OF CARCINOMA OF THE CERVIX, 1914–1921

Year	Number of cases	Time of observation	Symptom-free No. of cases	Per cent
1914–18	36	5 years	14	40.5
1919	23	4 years	11	47.8
1920	40	3 years	24	60.0
1921	48	2 years	28	58.3

TABLE VI.—AGES IN 505 CASES OF CARCINOMA OF THE CERVIX, 1914–1921

Age—years	No. of cases	Per cent
40 or less	96	19.01
41 to 45	70	13.86
46 to 55	171	33.86
56 to 65	132	26.14
Above 65	36	6.13

ought to be somewhere between 26 and 30 per cent.

A direct comparison between our figures and the 5 year results for surgically treated cases is not possible, because of the high percentage of inoperable cases in our series. In order to render such a comparison possible I have collected our operable and borderline cases in Table V.

During 1914 to 1918 inclusive we treated altogether 36 of these cases (19 operable and 17 borderline cases). Of these, 14 (40.5 per cent) were clinically cured after 5 years. The figures for 1919, 1920, and 1921 are 47.8, 60.0, and 58.3 per cent after 4, 3, and 2 years respectively.

Our results are thus at least on a par with the average result obtained by hysterectomy.

SUMMARY

In comparing the results of operable cases treated surgically with those operable cases treated radiologically, we should bear in mind:

1. That the result with radium treatment is obtained at the expense of a very small primary mortality. We have lost through peritonitis or sepsis a total of 6 in 505 cases, that is 1.2 per cent.

2. That in a considerable number of inoperable cases (1914–1918, 30 cases out of 181, or 16.6 per cent) clinical healing resulted and persisted for at least 5 years.

3. That of the remaining inoperable cases nearly 20 per cent, in some years more than 25 per cent, have still been symptom-free 3 years after the beginning of the treatment.

4. That in the majority of treated cases, even though a complete absence of symptoms has not been secured, a more or less lasting improvement has been obtained with a corresponding benefit to the patient.

5. That the radiological method of treatment probably has great possibilities of further development.

However, it must be emphasized that good results with radium treatment, just as with surgical treatment, can be attained only by a study of the patient, a proper knowledge of the limitations of the form of treatment, a carefully planned technique and experience. In the hands of the inexperienced the method involves great risks without any chances of results comparable to those secured with operation.

THE SURGICAL RESTORATION OF THE LINING OF THE MOUTH[1]

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From the Surgical Department of the Washington University Medical School

EXCEPT in those locations in which the mucosa of the mouth is directly attached to the underlying periosteum, as on the palate and gums, the healing of a loss from the full thickness of the mucosa is accomplished largely by the drawing together of the edges of the membrane bordering the raw area. The lining of the cheeks, lips, and the floor of the mouth is bedded upon a somewhat loose areolar tissue and is capable of great stretching and sliding. This permits of the surface obliteration of defects of considerable size but may entail permanent derangement of the contour or function. Therefore, in planning a surgical correction the distortion and fixation of the neighboring tissues, not the size of the scar, is the guide to the amount of lining to be replaced.

Following a loss in the mucosa, or of mucosa and underlying structures, the tongue may be bound down to the floor of the mouth or to the alveolar process or, if the alveolar process is missing, the tongue may become adherent

Fig. 1, *d*.

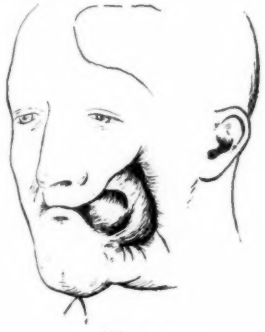

Fig. 1, *a*.

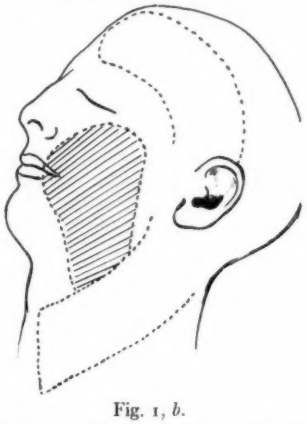

Fig. 1, *b*.

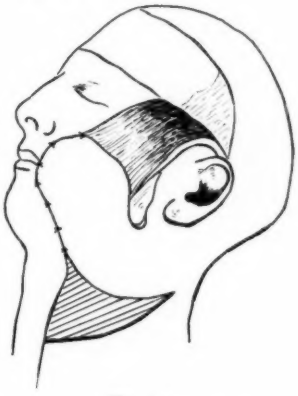

Fig. 1, *c*.

Fig. 1. Illustrating the restoration of the full thickness of the cheek by two separate pedicle flaps. *a*, The condition 3 months after the full thickness of the cheek, the alveolar process, and external covering of the body of the lower jaw were removed with cutting cautery and soldering iron for an extensive carcinoma arising in the mucosa of the cheek. *b*, Striped area, the extent of the original destruction and (in outline) the lining flap that was taken from the forehead, and the covering flap taken from the neck. *c*, These flaps sutured in place. Later the pedicle of the lining flap was cut and the base returned to the forehead. The blood supply of the new lining comes from the covering flap, which had been so planned that its pedicle was retained. *d*, The final result. The primary carcinoma was destroyed June 28, 1920. The neck dissections were made on December 4, 1920, April 5, 1921, and October 24, 1921. The repair was made in October and November, 1920.

[1] Read before the Western Surgical Association, December 6, 1923.

Fig. 2, *a*.

Fig. 2, *b*.

Fig. 2. *a*, A child who has lost the greater part of both lips and the lining of both cheeks, probably the result of noma. The jaws are completely locked together. *b*, The jaws blocked open after removal of the intra-oral scars that bound the maxilla to the mandible. The raw inner surface of the right cheek was lined by the tip of a long pedicle flap taken from the forehead, and the left cheek by a flap taken transversely from the upper part of the neck with the base of the pedicle on the right cheek. When a patient presents himself with jaws tightly fixed together by intra-oral scars, the extent of the original destruction, and of the subsequent scar formation may be largely a matter of conjecture. A narrow but firm band in one premolar region may fix the jaws almost as firmly as the complete destruction of the lining of both cheeks. In this case, before attempting to separate the jaws, it was surmised that the intra-oral scars replaced the whole of the lining of the right cheek and the anterior part of the left. The long forehead flap was prepared for delayed transplantation into the inner surface of the right cheek. At the second operation when the cheek scars were cut it was found that they extended back to the ramus of the mandible and the maxillary tubercle on both sides. The neck flap was raised and immediately transplanted into the left cheek and, as not infrequently happens with immediately transplanted flaps, the distal part of this neck flap sloughed. The scars at the posterior border of each of these flaps were subsequently released by inlay Thiersch grafts. The long pedicle of the forehead flap was later used to form the external surface of the lips.

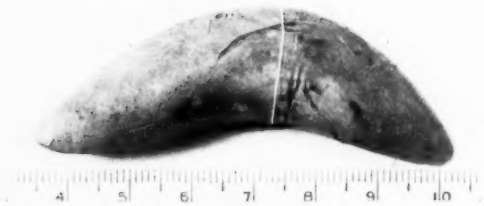

Fig. 3, *a*.

Fig. 3, *b*.

Fig. 3, *c*.

Fig. 3, *d*.

Fig. 3. Illustrating the replacement of the premaxilla and part of the maxilla by a prosthesis that is fitted into a sulcus made permanent by lining it with inlay Thiersch grafts. *a*, A molded wax form, a scant 7 centimeters from tip to tip, that was fitted into the sulcus which resulted from freeing the lip from the stump of the maxilla. The wax form was then removed, covered with a Thiersch graft, raw surface outward and then held in the new sulcus by suturing together the cut edges of the mucosa over the graft covered form. At a subsequent operation the cheeks were freed by a similar procedure. In the final condition this sulcus was lined with about 24 square centimeters of surface epithelium. *b*, The appearance of the patient before operation. *c*, The result of freeing the lip, the prosthesis not being in place. *d*, The patient with the upper plate in place.

Fig. 4, *a*.

Fig. 4, *b*.

Fig. 4, *c*.

Fig. 4, *c*.

Fig. 4, *d*.

Fig. 4. Illustrating the restoration of the lining of the cheek partly by the turning in of a pedicle flap from the skin of the cheek (base posterior), and then later by the reconstruction of the cheek defect by splitting a tubed arm flap so that part serves for lining and part for covering. *a*, The condition of the patient as she came to the Children's Hospital, before this final series of operations. The jaws are firmly locked. There is a fistula through the cheek and the latter is so infiltrated with scar that it would never permit free movement. On the neck are seen some of the scars that resulted from previous attempts to repair the cheek lining. *b*, The skin of the cheek turned in to line the posterior part of the left buccal cavity. *c*, A tubed flap prepared on the arm for reconstructing the cheek. *d*, The tubed flap in place. The upper pedicle has been cut and the skin of the end of the flap split so that part will line and part cover the new cheek. *e*, The final result. Some of the neck scars have been made less conspicuous and the patient is able to open the mouth to a degree fairly approaching normal.

to the cheek or to the lip, thus obliterating the normal vestibular sulcus. A destruction in the mucosa of the pharynx may be followed by adhesion of the velum that causes partial or complete atresia of the nasopharynx, or adhesion of the tongue that partially obliterates the lower pharynx; while loss of the facial covering will cause the dorsum of the tongue to be drawn up toward the velum.

Partial atresia of the nasopharynx will affect nasal respiration and voice quality. Total obstruction not only compels mouth breathing but by lack of posterior drainage of the nasal fossæ and of aeration may tend to im-

Fig. 5, *a*.

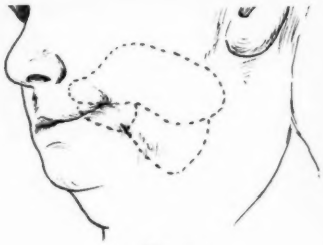

Fig. 5, *c*.

Fig. 5, *d*.

Fig. 5, *b*.

Fig. 5. Illustrating the simultaneous use of multiple inlay grafts to line the large sulcus that resulted from freeing the cheek from the maxilla and stump of the mandible after the cheek lining and much of the adjacent covering of the upper jaw had been destroyed with a cautery and part of the body of the lower jaw had been removed for extensive carcinoma of the cheek. *a*, Drawing showing scar of approach and the retraction due to adhesion of the cheek to the maxilla and to partial loss of the body of the mandible. *b*, The three pieces of wax that carried the inlay grafts. *c*, Their positions in the new cheek sulcus. *d*, Condition after the grafts had healed in place.

pair the function of the eustachian tubes. Fixation of the tongue to the fauces or posterior wall of the pharynx may interfere with swallowing, while fixation of the anterior part may affect speech, the intra-oral manipulation of food during mastication and the natural hygiene of the mouth. A scar within the cheek may limit or prevent separation of the jaws, and this will, of course, preclude mastication. Attachment of the tongue, lip, or cheek to the alveolar process for even a small distance may handicap the hygiene of the teeth and give rise to serious difficulty in the fitting and wearing of a dental plate. Any considerable fixation of the lip or cheek may affect contour or expression.

The surgical correction of any of these conditions is the release of the acquired fixation by cutting or excising the binding scar and the immediate epithelialization of the resulting raw surface. In doing this, allowance should be made for some subsequent scar contraction, and the raw surface should be stretched to the physiological limit while the newly applied Thiersch graft or epithelial bearing flap is healing in place.

Fig. 6, *a*.

Fig. 6, *b*.

Fig. 6. Illustrating the use of the inlay graft on the wax form inserted immediately after the deep removal of a carcinoma of the inside of the cheek with a cutting cautery. *a*, The outer circle shows the size on the surface of the defect that resulted from the removal of the cancer. In its deepest part the defect extended to the subcutaneous fat. This hole was immediately filled by the wax form shown in *b* which was covered with a Thiersch graft. All of the graft took except that in contact with the subcutaneous fat over the area shaded in the inner circle. This immediate grafting helped to avoid a secondary operation that otherwise might have been necessary to restore the cheek lining to permit opening of the mouth. The diameter of the sphenoidal-shaped wax form was considerably smaller than the diameter of the defect indicated in *a*, but after implanting the graft covered form the mucous borders were drawn together in a longitudinal suture line burying the graft so that the area grafted corresponded to the whole surface area of the wax form. This was approximately 4½ square inches while the fat area over which the graft failed to take was not over 1 square inch. It will thus be seen that the ungrafted area is proportionately very much smaller than appears from these surface markings.

Fig. 7, *a*.

Fig. 7, *d*.

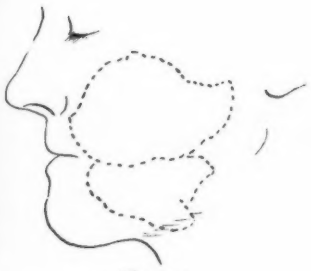

Fig. 7, *c*.

Fig. 7, *b*.

Fig. 7. Illustrating the use of multiple buried inlay grafts in association with covering and lining pedicle grafts in the reconstruction of a damaged cheek. *a*, A woman who, as the result of the reaction that followed the extraction of a tooth during the acute stage of infection, had a destruction of part of the full thickness, and all of the lining of the cheek, leaving her with the jaws locked, a fistula through the cheek, and the cheek itself distorted and adherent to the underlying bones. The cheek was pieced out with two flaps from the neck which furnished both lining and covering to replace the immovable scar. *b*, On account of the close adhesion of the remaining cheek tissue to the jaw bones this but partially relieved the locking of the jaws and did not relieve the distortion and flattening of the upper part of the cheek, therefore the soft tissues were freed from the bone as high up as the upper border of the maxilla and down to the lower border of the mandible, and two pieces of wax were molded into these sulci. *c*, This illustration shows the position and relative size of these wax forms which, after being covered with Thiersch grafts, were sutured in the newly made sulci. Notice the excessive size of these and all other Thiersch grafts to allow for subsequent shrinkage. *d*, The Thiersch grafts "took" throughout and this photograph shows the final condition. The cheek is filled and smoothed out. She has a free opening and is now wearing an upper and lower denture. The undue prominence of the lower part of the new cheek is related to the hurry and difficulties of operating on an excessive bleeder. She had four blood transfusions during the series of operations.

There are four general plans by which raw surfaces in or about the mouth may be epithelialized in preparation for, or after the release or removal of a scar.

The oldest, least efficient and least commonly applicable plan is the establishment of a narrow epithelialized tract within the normal tissue beyond the scar by means of a seton left in place until the epithelium grows in and lines the whole tract, like that made when the ears are "pierced" for earrings. When this tract has become epithelialized throughout, the scar is cut through into the tract as in an operation on an anal fistula. The narrow line of epithelium at the bottom of the cut will prevent the reunion of the two raw surfaces if they are not allowed to remain in contact during the healing but it will not prevent their subsequent contraction. This plan has been used in releasing adhesions of the velum and narrow cheek bands but there is no place where it cannot be advantageously replaced by a properly applied inlay Thiersch graft.

Owing to the normal superabundance of the buccal mucosa certain raw surfaces can advantageously be covered by using a pedicle or sliding flap taken from the immediate neighborhood. The mucous flap is most useful for the covering of small areas, such as the raw surface resulting after the simple excision of a narrow band, restoration of the vermilion border of the lip, the release of a mucous plica in the buccal fornix, the release of tongue-tie and restorations about the nasopharynx. The use of a mucous pedicle flap usually presupposes that the resultant raw surface can be closed by drawing together its mucous edges

Fig. 8, *b*.

Fig. 8, *c*.

Fig. 8, *d*.

Fig. 8, *e*.

Fig. 8, *a*.

Fig. 8. Illustrating the use of the buried skin graft to allow for the use of a tooth carrying prosthesis that will compensate for lack of development of the lower jaw. This 22-year-old boy lost all the teeth and tooth buds in the lower jaw with the exception of the left third molar at the age of 6 years. The jaw will not develop where the tooth buds are lost therefore he had a 6-year-old lower jaw. The ramus was too poorly developed to permit of a sliding operation and he had neither the time nor the money to allow him to have a series of bone grafting operations. To give some body to the chin a large piece of the eighth left costal cartilage was grafted in front of the bone and the neck covering was slid upward. *a*, Eight months after this first operation the wax form here shown was covered with a Thiersch graft and buried in a sulcus formed by an incision through the mucosa just anterior to the cartilage graft and extending down to its lower border. The entire graft united. *b*, *c*, *d*, and *e*, The condition a year after the first graft operation. The prosthesis was made by Dr. James Brown.

by immediate suture, by scar contraction, or by Thiersch graft, without impairment of function.

A pedicle skin flap can be turned in from the outside, through the oral fissure or through some artificial opening. Later after the flap has obtained a new blood supply the pedicle is cut and returned to its original bed. Only hair-free skin should be used, as otherwise the hair will continue to grow after the skin is transplanted into the mouth. This may happen with deeply cut Thiersch grafts taken from the thigh.

The skin covering a flap that has been transplanted into the mouth becomes pink in color and somewhat resembles mucous membrane. In a few cases it raised up in wart-like ridges. This was interpreted to mean that an excess of skin had been used and the condition was relieved by removing part of the transplant.

The simplest and a widely applicable plan of epithelializing freshly made raw surfaces within the mouth is by means of a Thiersch graft draped over a form that holds the graft in close contact with the bare area. When properly done this type of skin graft usually "takes" throughout regardless of the fact that the raw surface has almost necessarily been contaminated with saliva. Even pressure that controls oozing and prevents accumulation of fluid between the graft and the bed seems to insure prompt healing in the vast majority of cases.

The general plan of stretching a Thiersch graft over a wax form and burying it in the tissue was brought out during the war chiefly by Esser, and by Gillies and Waldron. Esser buried his graft in a sterile field only. When it was intended that the graft should line part of a mucous cavity, the graft covered form was buried under the scar through an incision made from the skin surface, which latter was sutured. Later the mucous scar was incised so as to convert the grafted cavity and the mucous cavity into one. Waldron and Gillies very much simplified this procedure by incising directly into the skin or mucosa, as the case might be, disregarding any ordinary sources of contamination. We employ the latter plan in all our cases.

In some conditions the inlay graft can be used supplementary to the pedicle graft or

Fig. 9, *a*.

Fig. 9, *b*.

Fig. 9, *c*.

Fig. 9. Illustrating case of cancer in which the left body of the mandible, floor of mouth, and full thickness of the lower half of cheek and submaxillary regions were removed, with cutting cautery. Repair was made with the forehead flap divided so that one half was used for the external cheek defect and one half to line a sulcus that received a prosthesis to replace the lost half of the mandible. *a*, The wide pedicle flap dropped from forehead and implanted in the defect. *b*, The final repair with pedicle cut and returned to the forehead. The surface irregularities could be easily adjusted but he is a laboring man and has returned to his work and does not mind the appearance. *c*, A denture made by I. B. Dunhaupt, D.D.S., of this city. The body fits into the skin-lined sulcus while the hook fits into a little pocket made to receive it. The clasp fits the teeth of the opposite side. The patient can chew soft things on this side and eats a laboring man's food without inconvenience.

vice versa, or a mucous graft may supplement a pedicle skin graft. A pedicle skin graft turned in to form the lining of the cheek may heal perfectly and yet leave a binding scar at its anterior border that will still limit the opening of the mouth. This might subsequently be released by incising the band and then covering the resulting raw gap with an inlay graft, or a mucous pedicle graft, the mouth being blocked open while the latter is healing in place. If the buccal scar is attached directly to the alveolar process, either above or below, the obliterated fornix will not be restored by simply lining the cheek with a pedicle flap but will require in addition a deep inlay graft after the pedicle graft has healed in place. The scar at the posterior part of the flap may require the same treatment. The inlay Thiersch graft may be used immediately to cover the raw surface from which a pedicle mucous flap has been raised, and this inlay graft can be used in combination with mucous pedicle grafts in correcting atresia of the nasopharynx. We have successfully used this plan to cover the raw surface immediately after excising an epithelioma of the cheek with a cutting cautery.

The essential difference between the Thiersch graft and the pedicle graft, whether of skin or mucosa, is that the latter carries with it the derma and the submucous or subcutaneous tissues while the former consists of epithelium alone or epithelium and a very thin layer of derma. In making the choice one may be influenced by expediency as well as by the needs of the particular case. The pedicle skin flap with a varying amount of subcutaneous tissue is most useful in the restoration of the whole lining of the cheek, especially in those cases in which a considerable thickness of the cheek is to be restored. When the full thickness of the cheek or lip is lost two pedicle skin flaps may be used in combination, one for the lining and one for the covering. In the Martin technique the sulcus, which receives the prosthesis that substitutes a section of the body of the mandible, can advantageously be lined by a pedicle skin bearing flap graft; this flap, at times, can best be prepared before the section of bone is removed. The raw surface of the

Fig. 10, *a*.

Fig. 10, *b*.

Fig. 10, *c*.

Fig. 10, *d*.

Fig. 10, *e*.

Fig. 10. Illustrating a case in which the lining flap was prepared before one-half the body of the mandible was excised for a tumor of low-grade malignancy and in which the lost bone was later replaced by a tooth bearing prosthesis. *a*, A man who had had a partial amputation of the body of the jaw with bone graft for a cystic adamantinoma. The bone graft was short as shown by lack of incisor occlusion and the retracted chin, while the amputation was still shorter, because the tumor recurred in both ends of the bone. The tubed pedicle flap (shown in *a*) was prepared, and also a splint made by Captain P. Paquin, D.C., of the Veterans' Hospital that would hold the left half of the mandible in proper relation with the maxilla after the removal of the right half. When this neck flap was ready for use, the right half of the mandible was removed with the tumor, the left base of the flap was cut, and the tube opened up and used to line the sulcus from which the bone was removed. Two weeks later the right base was cut and the pedicle adjusted within the mouth. Captain Paquin made the prosthesis, shown in *e*. The teeth to the right of the midline, in *e*, are carried on the prosthesis. This prosthesis gives, on the average, good service but has not the same resistance to hard food as an ordinary plate resting on bone. Comparing *b* with *c* it will be seen that the chin has been brought forward to its normal position which restored the proper occlusion of the incisors.

pedicle flap may be Thiersch grafted before or after it is transplanted. It is safest to use these skin bearing flaps as delayed transplants but this procedure is not so frequently necessary nor practical in the use of mucous flaps.

Because of the simplicity of application and the rather uniform certainty in results the inlay Thiersch graft applied over a form has the widest field of usefulness in replacing the epithelial lining of the mouth. This inlay graft is the most effective plan of restoring the buccal or labial sulci, lengthening the mucosa of the lip, covering raw surfaces after shifting a mucous flap, releasing the scar band at the edge of an implanted skin flap, and releasing pharyngeal adhesions.

The wax form keeps the raw surface stretched while the graft is uniting but there is a variable amount of subsequent contraction which is always considerable. In using this type of graft, where possible, an allowance for at least 60 per cent contraction should be made. That is, if it is desired to restore the buccal sulcus to a depth of 5 millimeters, the incision in which the graft is to

Fig. 11, *a*. Fig. 11, *b*.

Fig. 11, *d*.

Fig. 11, *e*.

Fig. 11, *f*.

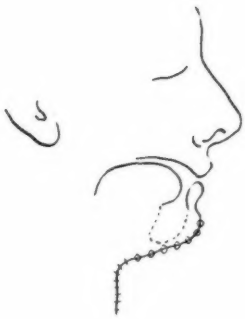

Fig. 11, *g*.

Fig. 11, *h*.

Fig. 11. Illustrating a case in which, at 9 years, the right half of the jaw and all of the tooth buds on the left side were lost from necrosis and the help of a curette. The face tissues over the lost bone failed to develop. Repair was done in this case by turning a neck flap into the floor of the mouth to serve as lining of a sulcus, and by covering the submaxillary region and posterior part of cheek with a flap from the forehead. On the diagram *g* the lining of the sulcus in the floor of the mouth is indicated by a dotted line. This lining skin was obtained by turning in a short flap of neck skin with a long base attached close to the incision through which it entered the mouth and extended from the midline to close the temporomandibular joint. The little crossmarks on the front of the neck below this indicate the area from which this neck flap was taken while the line marked with little circles represents a cross section of the forehead flap in its new position. The final position of this forehead flap is also shown in *h* with the pedicle still attached in the temporal region. Figures *a*, *b*, *d*, and *e* are photographs taken before and after this reconstruction; *f* shows the prosthesis made by Dr. James Brown of this city. As yet it carries only incisor teeth and the patient has some difficulty in wearing it, but this will become adjusted when the appliance has been used further. The silver ball on the long arm fits in a skin-lined pocket close to the glenoid fossa.

be buried should be made 15 millimeters deep and the wax form should be 10 or 15 millimeters in diameter.

In making the incision to restore the buccal sulcus the dissection should be made close to periosteum; otherwise a pad of soft tissue lying on the bone may interfere with the future fitting of a dental plate and require some minor, secondary operation.

NOTE.—This study is based on a series of cases treated in association with Dr. Ellis Fischel, Dr. Earl C. Padgett, and the resident staff of the Barnes Hospital, the St. Louis Children's Hospital, the St. Louis Mullanphy Hospital, and St. Luke's Hospital.

TREATMENT OF PELVIC SUPPURATION[1]

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I HAVE chosen the subject of pelvic suppuration because it is a condition always dangerous and therefore of interest to every surgeon. In the treatment of this condition I have originated a technique which in my practise has been life-saving.

Under the term pelvic suppuration I include all cases in which pus (whatever its origin) is encapsulated in the pelvis by adventitious adhesions or in which tubes and ovaries are transformed into pus sacs. In the year 1895 the mortality rate following operations in the Sydney Hospital for these conditions was 20 per cent. This mortality rate fell to 5 per cent on the introduction of my two-stage method. Such improvement took place without any marked advance in aseptic technique.

The procedure is as follows:

When there are indications of the presence of pus or any acute pelvic condition, a preliminary vaginal cœliotomy is made, usually posterior to the uterus, into Douglas' pouch, but when the physical signs point to the collection being anterior to the uterus, the bladder is dissected up and the entry made into the uterovesical pouch. The pus is evacuated, the pus sacs are defined and punctured, and a large split rubber tube inserted and stitched in the opening. The tube is split in order to lessen the danger of pressure necrosis of the inflamed, softened bowel. Iodoform gauze is sometimes used in addition, but never passed into the tube. What is called a dressed tube is inefficient as a drain, for the gauze becomes quickly clogged and acts as a cork. In 48 hours after this operation the constitutional symptoms have usually undergone a great improvement and at the end of a week, or perhaps a few days more, the patient having got rid of the toxins, feels well and as she often says "is a new woman." She then undergoes the second stage of the operation. After removal of the gauze and tube, the track and vagina are cleansed with peroxide of hydrogen —1 in 4—abdominal section is performed, and the focus, whether pus tubes, ovarian abscess, or appendix, or all three, is removed and a fresh drain placed through the vagina.

All acute pelvic conditions are operated upon without delay[2]; if the patient is very ill, on the day of admission.

"Waiting for the temperature to settle down and the pus to lose its infectivity" has not been practised. Should one fail to evacuate pus by the vaginal section, abdominal section is performed at the same sitting, the offending focus removed, and vaginal drainage established. Should there be a pus collection in the false pelvis, an additional split rubber drainage tube is passed, through a stab wound low down, just outside the deep epigastric artery, and carried down to the bottom of the pelvis, hugging the pelvic wall in its course so as to avoid the small intestine area and subsequent crippling adhesions. The external orifice of the tube is kept covered with squares of dry gauze changed very fre-

[2] This does not apply to a first attack of unquestionably gonorrhœa salpingitis of a mild type.

[1] Presented before the Clinical Congress of the American College of Surgeons, New York, October 20–24, 1924.

quently. A split rubber drainage tube has been objected to by some on the ground that it does not drain so efficiently. This is a mistaken view. All that is required is an open gutter, which, with the help of intra-abdominal pressure and position will carry off offending fluids as certainly as the house gutter will carry away the rain.

When drainage is used after appendicectomy this is the form I employ, and always through a separate stab wound. The tube is rotated and shortened at the end of 24 hours and usually removed at the end of 48 hours.

Some surgeons advocate treating pus collections in the pelvis by incision in the vaginal vault and drainage alone, without any attempt to remove the focus—the cause of the trouble—either at the time or subsequently, i. e., they are content to practice the first stage of the method which I advocate. We have had many proofs that this course is a mistake. Some of our patients have felt so well after the vaginal evacuation that they have refused further operation; in almost every such case which we have been able to trace there has been a recurrence of the trouble and the patient has returned to hospital sooner or later in a more dangerous condition than before because adhesions have become denser.

An acute infection of or recrudescence of activity in an old focus is one of the most dangerous conditions which can be dealt with in the pelvis; the adhesions in such cases are much stronger than the softened viscera to which they are attached, and the greatest care is necessary to effect separation and removal of the focus without serious injury to vital structures. When the focus is allowed to remain in the pelvis the patient is never really cured; she is not such a healthy woman as she otherwise would be, and in addition she is always in danger of an impending calamity. (A cellulitic abscess does not come into this argument. In such cases there is nothing to remove but the pus, and this of course should be evacuated extraperitoneally.)

In addition to its use under the above circumstances, vaginal cœliotomy is always practised preliminary to abdominal section, when there is reason to anticipate a considerable number of adhesions or unusual difficulties from past infection. Iodoform gauze is passed into the wound in the vaginal vault and this is a landmark in carrying out the removal of the focus or foci from above.

In my last term of office in the Sydney Hospital, 93 pus cases were operated upon by this technique with one death, a mortality rate of 1.075 contrasted with a rate of 25 per cent in my first term. The one death was a patient operated upon in another hospital 8 weeks previously. An enterovesical fistula and extensive suppuration extending into the upper abdomen had resulted. There were grave constitutional symptoms and the patient had not sufficient strength and vitality for the ordeal of the operation. Streptococci were found in the pus.

When it is necessary to remove both tubes and a pus collection is present, especially if this be anterior to the uterus, it is good practise to do total hysterectomy. This procedure was carried out in 18 of the 93 pus cases. If the technique of total hysterectomy which I brought before the profession in 1917 be adopted, the operation is not materially prolonged and there is no additional shock.[1]

I am well aware that opening a pelvic abscess through the vaginal vault is one of the oldest surgical procedures, but I think I was the first to use and advocate it as part of an operative technique by which pelvic suppuration can be treated and *cured* with a minimum of risk.

The late Sir Frederick Treves, whose writings are characterized in a high degree by clinical acumen, used to teach that in abdominal conditions it is best to wait if possible until acute symptoms have subsided in order that advantage may be taken of the period of immunity which then occurs. On the other hand, he urged that operation should not be delayed too long because the immunity did not last indefinitely but only for a week or two.

In my own practise I have found that this immunity has been brought about more swiftly, surely, and safely, by a preliminary vaginal cœliotomy than by waiting for the processes of nature.

Most modern writers favor expectancy, advising the postponement of operation for some

[1]Ass. J. Obst. & Gynec., 1917, Dec.

months, admitting at the same time that streptococci may remain dormant for years and then light up into fresh activity. This practise necessarily implies prolonged invalidism, and in the end the operative risk, not positively diminished, must be faced, with the additional danger arising from dense adhesions.

The conclusions drawn from the personal experience which I have given may of course be mistaken, but it is noteworthy that former internes and assistants have adopted the technique, the results from which they have themselves seen.

To send a patient home telling her to return in 6 or 7 months means a serious interference with family life, causes much mental anxiety, and more or less physical suffering and at the same time imposes a financial burden which most patients can ill afford.

SUMMARY

Taking a broad view of pelvic infection and suppuration, and taking into consideration the danger, disability, and suffering both immediate and remote associated with this condition, and also the extreme rarity of complete cure by expectancy, I maintain that the best treatment is immediate operation which can be carried out with a minimum of risk by means of the two-stage operation described in this article.

THE TREATMENT OF MALIGNANT TUMORS OF THE PHARYNX AND NASOPHARYNX[1]

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In the treatment of malignant tumors of the pharynx and nasopharynx, the method of treatment or combination of methods best suited to the particular type of growth should be employed. Surgery, cautery, diathermy, radium or X-ray, or a combination may be chosen, according to the indications, each having its definite value. It is generally accepted that the extent and location of the growth, as well as the age of the patient and the presence of metastasis, have a definite bearing on the treatment indicated. It is known that the cases in the sarcoma group, such as the lymphosarcomata, are best treated by radium or X-ray, rather than by operation, and that certain epitheliomata of the pharynx respond more readily to cautery and surgical treatment, while others are better treated by X-ray and radium. Broders, by his microscopic gradation of epitheliomata into four grades according to their malignancy, has aided materially in explaining the reason for this. This gradation also has aided greatly in determining the best treatment for the individual case, and the prognosis. The reaction to treatment is largely dependent on the degree of malignancy. High grades of malignancy, such as those of Grade 3 or Grade 4, act similarly to a rapidly growing sarcoma, metastasizing early; therefore, surgery and cautery are of little use if such conditions in the pharynx are extensive. But if the lesions are of a low grade and can be excised, they should be subjected to cautery excision or diathermy and radium treatment locally; the glands of the neck should be removed later and radium treatment given before and after operation, if the local condition warrants such a procedure. The epitheliomata of the nasopharynx and pharynx are practically all of a high grade of malignancy, 3 or 4, rarely 2. This accounts for the fact that better results usually follow the use of radium than of operative measures.

Primary malignant tumors of the nasopharynx and pharynx only have been included in this study; they are classified into three anatomical divisions: (1) malignant tumors of the nasopharynx, (2) those of the pharynx, and (3) those of the hypopharynx. In many cases the tumor involved either two or three of these areas, and such cases have been classified according to the location in which the growth probably originated.

In reviewing these cases, the patients have been divided into two groups in each of the anatomical divisions: Group 1 includes those who have received treatment. The local condition was treated with radium, or cautery and radium. The cervical glands were excised with the knife or cautery, or radium was used with distance and screening or as emanation seeds inserted directly into the glands. This group includes the patients considered not beyond relief or possibly even cure. It does not include the patients whose condition seemed so hopeless that treatment would be of no value. I believe it is well to take note of this latter group because many patients are undoubtedly made worse by partial treatment, and it is unjust to put a patient to the pain and expense of treatment when his condition is absolutely hopeless. Many patients with extensive involvement have been included in this group, however, as an attempt to give symptomatic relief was made in many cases, when the patients lived near enough so that they could return at frequent intervals for observation. Group 2 includes the patients whose lesions were so extensive that treatment could be of no value. It also includes a group of patients who lived so far from the Clinic that they decided to take treatment where they could return at frequent intervals. A few patients are included in this second group who received one or two radium treatments, even though their condition was hopeless. The limits of these

Read before the meeting of the American College of Surgeons, New York City, October 21, 1924.

two groups have been somewhat elastic, depending on the different types of tumors. Some of the lymphosarcomata treated were much more extensive than the epitheliomata, on account of the better prognosis for the former. No attempt has been made to give the details of radium treatment in these cases, as each presents an individual problem, requiring special consideration, and any general statement regarding the dosage would be of little value.

MALIGNANT TUMORS OF THE NASOPHARYNX

Malignant tumors of the nasopharynx have been divided into three types: epitheliomata, lymphosarcomata, and a group in which the exact pathology is indeterminate. Fibromata of the nasopharynx might also be included, as they are clinically malignant, although microscopically benign. They produce death by extension into the skull, but never metastasize.

The results of treatment of malignant tumors of the nasopharynx are usually not good, for several reasons. (1) It has been brought out in a previous paper that the tumors are thought to be uncommon and are frequently overlooked so that a diagnosis is not made until the tumor is quite extensive. (2) The location of the tumor makes it difficult to determine its extent accurately, and to apply treatment. (3) The grade of malignancy is high, usually 3 or 4, and metastasis takes place early. Occasionally an adenocarcinoma or a low-grade malignant growth is seen in the nasopharynx, but this is unusual. In 65 per cent of the patients whom we examined, glands of the neck were involved. (4) Twenty-five per cent of the patients had neurologic symptoms at the time of examination.

It is generally recognized that surgery offers little in cases of malignant tumors of the nasopharynx. Crowe and Baylor, in reporting a group of cases, have shown the value of radium in the treatment. Coley has reported an inoperable, recurrent malignant tumor of the nasopharynx which disappeared under the use of mixed toxins. Patterson has reported immediate good results following the use of diathermy.

From 1917 to 1923, inclusive, 119 patients with malignant tumors of the nasopharynx were examined in the Mayo Clinic. Of these, 60 had epitheliomata, 43 lymphosarcomata, and 16 tumors of an indeterminate type. Thirty-nine of the patients with epithelioma, and 20 of those with lymphosarcoma belonged to Group 2, and were not treated. In the treated cases, radium was used, both locally and outside the neck. The glands of the neck were not removed on account of the usual poor prognosis of the local condition. Radium treatment was used in the nasopharynx, either by means of a curved lead applicator, the radium being held in the trough of the applicator, or by means of radium needles, or emanation seeds in the more recent cases. Radium is also used over the neck externally, with distance and screening, and seeds in certain cases of cervical involvement. The immediate symptomatic relief in some cases, even most extensive ones, is quite striking, with relief from pain and the prolongation of life for months or years (Tables I and II).

In a previous paper, Figi and I reported the end-results in 32 cases of fibromata of the nasopharynx, treated between 1910 and 1923. From 1910 to 1915, 8 patients were examined, 5 of whom were operated on. The tumors were removed by the avulsion method, and there were 2 operative deaths; the 3 other patients were not traced. From 1915 to 1923, 24 patients with fibromata of the nasopharynx were examined; 1 was not treated, and 4 were not traced. Of the 19 others, 15 were cured by the use of radium. Four patients who registered during 1923 were markedly improved, but were still under treatment.

MALIGNANT TUMORS OF THE PHARYNX

The malignant tumors of the pharynx have been divided into three types: epitheliomata, lymphosarcomata, and mixed tumors. There was also a small group of special types of sarcoma. An attempt has been made to divide the malignant tumors of the tonsil from those of the rest of the pharynx; this is difficult because usually it is impossible to determine the exact origin of the tumor, and often both pharynx and tonsil are involved. The epitheliomata and lymphosarcomata in this

group are of a very active type of malignancy. In many cases the history is only a matter of a few weeks or months, the glands becoming affected early. These tumors are sometimes thought to be inflammatory, Vincent's angina, or syphilitic, and are treated accordingly. Low-grade malignancies, however, do occur in this region.

Aboulker, in reporting the value of local anæsthesia in operations for cancer of the mouth and throat, asserts that only 1 of 28 patients was well for 5 years after the removal of an epithelioma of the soft palate and tonsil. Amersbach asserts that no case of cancer of the larynx or pharynx has yet been cured by X-ray treatment, and that the results of surgical treatment for extensive cancer of the pharynx are usually bad, although a cure can be effected in a few cases. Ferreri reports 3 cases in which X-ray treatment was employed for cancer of the pharynx; 2 of the patients have apparently been cured for months. Quick made a careful review of the treatment given at the Memorial Hospital, New York, for malignant tumors of the tonsil, in which the emanation needles were used for the local condition, as suggested by Janeway. The latter adopted conservative treatment for the glands of the neck, using X-rays over the cervical region and waiting until nodes appeared before attempting any surgery, then either performing a block dissection, or exposing the involved nodes and inserting emanation tubes. Grier reports the treatment of 2 cases of epithelioma of the tonsil with deep X-rays, but as the patients have been well only 10 months, it is too soon to determine the value of this treatment. He inserted radium needles into the tonsils and applied deep X-rays over the glands of the neck. From 1917 to 1923, inclusive, we have examined 136 cases of malignant tumors of the pharynx, including the tonsil: 79 epitheliomata, 37 lymphosarcomata, 14 mixed tumors, 3 malignant tumors of indeterminate type, and 3 sarcomata of special type. Of the 79 patients with epithelioma, 24 were in Group 1, and 55 were in Group 2. Of the 37 patients with lymphosarcoma, 20 were in Group 1, and 17 in Group 2. The lymphosarcomata were treated with radium both inside and outside of the neck, radium tubes being used in preference to seeds on account of the difficulty of maintaining the seeds in place in these soft tumors. The epitheliomata were treated, as a rule, according to the grade and type of malignancy. Low-grade, localized epitheliomata of the pharynx were removed with the cautery, their bases cauterized, and then radium treatment used locally and over the neck. The glands of the neck were removed with knife or cautery dissection when the prognosis of the local condition made it seem advisable. In the active cases, Grade 3 or 4, if the lesion was too extensive for cautery excision, radium treatment alone has been used, emanation seeds or needles being inserted directly into the growth and radium or X-ray applied outside the neck. In some cases the emanations have been inserted directly into the glands (Tables III and IV).

TABLE I.—RESULTS OF TREATMENT IN TWENTY-ONE CASES (GROUP 1) OF EPITHELIOMA OF THE NASOPHARYNX[1]

Patients treated and traced		18
Patients living		6 (33.3 per cent)
	Months	
Average life following treatment	25	
Longest life following treatment	65	
Patients dead		12
Average life following treatment	16.4	
Longest life following treatment	35	
Average length of life after examination of treated patients	19.3	
Average length of life after examination of untreated patients	5.8	

[1] Three patients could not be traced; 39 others were in Group 2.

TABLE II.—RESULTS OF TREATMENT IN TWENTY-THREE CASES (GROUP 1) OF LYMPHOSARCOMA OF THE NASOPHARYNX[1]

Patients treated and traced		16
Patients living		5 (37.5 per cent)
	Months	
Average life following treatment	55	
Longest life following treatment	91	
Patients dead		11
Average life following treatment	12.6	
Longest life following treatment	26	
Average length of life after examination of treated patients.	25.8	
Average length of life after examination of untreated patients	6.3	

[1] Seven patients could not be traced; 20 others were in Group 2.

TABLE III.—RESULTS OF TREATMENT IN TWENTY-FOUR CASES (GROUP 1) OF EPITHELIOMA OF THE PHARYNX AND TONSIL[1]

Patients treated and traced		19
Patients living		4 (21.0 per cent)
	Months	
Average life following treatment	27	
Longest life following treatment	58	
Patients dead		15
Average life following treatment	28.1	
Longest life following treatment	75	
Average length of life after examination of treated patients	27.8	
Average length of life after examination of untreated patients	7.5	

[1] Five patients could not be traced; 55 others were in Group 2.

TABLE IV.—RESULTS OF TREATMENT IN TWENTY CASES (GROUP 1) OF LYMPHOSARCOMA OF THE PHARYNX AND TONSIL[1]

Patients treated and traced		14
Patients living		8 (57.2 per cent)
	Months	
Average life following treatment	51.3	
Longest life following treatment	72	
Patients dead		6
Average life following treatment	46.6	
Longest life following treatment	72	
Average length of life after examination of treated patients	49.5	
Average length of life after examination of untreated patients	2.9	

[1] Six patients could not be traced; 17 others were in Group 2.

TABLE V.—RESULTS OF TREATMENT IN FIFTEEN CASES (GROUP 1) OF EPITHELIOMA OF THE TONSIL[1]

Patients treated and traced		14
Patients living		4 (30 per cent)
	Months	
Average life following treatment	27	
Longest life following treatment	58	
Patients dead		10
Average life following treatment	24.5	
Longest life following treatment	75	
Average length of life after examination of treated patients	25.2	
Average length of life after examination of untreated patients	7.9	

[1] One patient could not be traced; 26 others were in Group 2.

There were 3 cases of special types of sarcoma of the pharynx in which radium was used. One was a case of fibromyxosarcoma; the patient is alive 26½ months later. One was a case of mixed-cell sarcoma of the pharynx; the patient died 9 months after treatment. The third was a case of fibrosarcoma of the tonsil and pharynx; the patient lived 19 months after treatment.

Malignant tumors of the tonsil are considered separately, although, as has been observed, this may not be an absolutely accurate classification. In this group there were 41 epitheliomata and 16 lymphosarcomata. Of the 41 cases of epithelioma, 15 were in Group 1 and 26 in Group 2; 2 of the 15 patients were not traced. Of the 16 cases of

TABLE VI.—RESULTS OF TREATMENT IN EIGHT CASES (GROUP 1) OF LYMPHOSARCOMA OF THE TONSIL[1]

Patients treated ant traced		5
Patients living		2 (40 per cent)
	Months	
Average life following treatment	30	
Longest life following treatment	48	
Patients dead		3
Average life following treatment	61	
Longest life following treatment	72	
Average length of life after examination of treated patients	45.5	
Average length of life after examination of untreated patients	4.3	

[1] Three patients could not be traced; 8 others were in Group 2.

TABLE VII.—RESULTS OF SURGICAL TREATMENT IN TEN CASES (GROUP 1) OF OPERABLE MIXED TUMORS OF THE PHARYNX[1]

Patients treated and traced		9
Patients living		8 (88.8 per cent)
	Months	
Average postoperative life	48.6	
Longest postoperative life	82	
Patients dead		1
Postoperative life	32	
Average postoperative life of patients traced	46.8	

[1] One patient could not be traced.

TABLE VIII.—RESULTS OF RADIUM TREATMENT IN FOUR CASES (GROUP 1) OF INOPERABLE MIXED TUMORS OF THE PHARYNX[1]

Patients treated and traced	3
Patients living	3
Months	
Average life following treatment	17.6
Longest life following treatment	29

[1] One patient could not be traced.

lymphosarcoma, 8 were in Group 1, and 8 in Group 2 (Tables V and VI).

Mixed tumors of the pharynx are entirely different from the others. They are of a very low-grade encapsulated type. Usually they have existed for a long time, filling the greater part of the pharynx or bulging out into the neck, either posterior to the angle of the jaw, or in the cervical region. The tumors are usually freely movable. This type should always be treated surgically, if possible, the tumor being removed through the mouth or through the outside of the neck. If the tumor has broken through its capsule, if it is fixed, or recurrent, radium should be used, but not otherwise. Of 14 cases of mixed tumors of the pharynx, 10 were operable and 4 inoperable, the latter having been treated with radium. Thus all cases received treatment (Tables VII and VIII).

MALIGNANT TUMORS OF THE HYPOPHARYNX

Tumors originating at the base of the tongue, in the pyriform fossa, or in the post-cricoid region, have not been included with the malignant tumors of the hypopharynx, but

TABLE IX.—RESULTS OF TREATMENT IN NINE CASES (GROUP 1) OF EPITHELIOMA OF THE HYPOPHARYNX[1]

Patients treated and traced		7
Patients living		3 (42.8 per cent)
	Months	
Average life following treatment	31.3	
Longest life following treatment	43	
Patients dead		4
Average life following treatment	5.8	
Longest life following treatment	10	
Average length of life after examination of treated patients	16.7	
Average length of life after examination of untreated patients	4.2	

[1] Two patients could not be traced; 30 others were in Group 2.

TABLE X.—RESULTS OF RADIUM TREATMENT IN TWO CASES OF LYMPHOSARCOMA OF THE HYPOPHARYNX

Patients living		1
	Months	
Length of life after examination	31	
Patients dead		1
Length of life after examination	15	

TABLE XI.—LONGEVITY IN TREATED AND UNTREATED CASES OF MALIGNANT TUMORS OF THE PHARYNX AND NASOPHARYNX

Lesion	Group 1									Group 2	
	Patients treated and traced	Living	Percentage	Average life following treatment, months	Longest life following treatment, months	Patients dead	Average life following treatment, months	Longest life following treatment, months	Average life of all patients treated and traced, months	Average life following examination, months	Longest life following examination, months
Nasopharynx											
Epithelioma	18	6	33.3	25.0	65	12	16.4	35	19.3	5.8	14
Lymphosarcoma	16	5	37.5	25.8	91	11	12.6	26	25.8	6.3	11
Pharynx and tonsil											
Epithelioma	19	4	21.0	27.0	58	15	28.1	75	27.8	7.5	23
Lymphosarcoma	14	8	57.2	51.3	72	6	46.6	72	49.5	2.9	9
Tonsil											
Epithelioma	14	4	30.0	27.0	58	10	24.5	75	25.2	7.9	19
Lymphosarcoma	5	2	40.0	30.0	48	3	61.0	72	45.5	4.3	9
Pharynx											
Mixed tumor (surgical)	10	9	88.0	48.6	82	1	1 died after 32 mo				
Mixed tumor (radium)[1]	3	3		17.6	29			nths			
Hypopharynx											
Epithelioma	7	3	42.8	31.3	43	4	5.8	10	16.7	4.2	
Lymphosarcoma	2	1	31.0			1	1 die 15 mo	d after nths			

[1] Three patients with inoperable mixed tumors have been treated with radium and are living at the present time.

only those of the lateral and posterior pharyngeal wall of the hypopharynx. In this group there were 41 malignant tumors, 39 epitheliomata, and 2 lymphosarcomata. Thirty of the patients with epithelioma were in Group 2. Both of the patients with lymphosarcoma received treatment. Their treatment was the same as that used for similar tumors of the pharynx.

Surgical treatment was not attempted for the local condition, but in the cases of epithelioma, the glands of the neck were removed, if they were involved, and if the local condition warranted it. These cases were treated with radium, locally, needles or seeds being used, and radium also outside of the neck (Tables IX, X and XI).

In Table XI the results of the treatment of the various types of malignant tumors in the different locations are compared and the findings in Tables I to X are combined.

SUMMARY

Malignant tumors of the pharynx and nasopharynx are usually of a very high grade of malignancy, either lymphosarcomata or epitheliomata, Grade 3 or 4 (Broders). In the treatment and prognosis of pharyngeal tumors, Broders' gradation of epitheliomata is of definite clinical value.

Discrimination is necessary in the selection of patients with malignant conditions of the pharynx and nasopharynx, whose tumors are very extensive, as in certain instances the treatment given is detrimental rather than beneficial.

The patients who are treated should receive thorough and radical treatment, which may consist of surgery, cautery or diathermy, radium or X-ray, or any combination of these methods, as indicated.

Most of the patients treated received marked symptomatic relief; some had their lives prolonged for months or even years, while others are apparently cured.

Mixed tumors of the pharynx should be removed surgically, if possible, and other forms of treatment used only if they are inoperable.

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DERMOID CYSTS OF THE FLOOR OF THE MOUTH[1]

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DERMOID cysts may be found in the orbit, in the region of the ear, in the nose, the base of the skull, the neck, the sternum, the mediastinum, the ovary, the sacrum, the wall of the bladder, the scrotum, and the perineum. As a group, these tumors are not uncommon. Those of the floor of the mouth are rare. They have been the subject of several very comprehensive theses in French (8, 12, 15, 28, 31) and have not infrequently been reported by English and German surgeons. However, our literature contains records of but few cases (6, 14, 36).

For a long time, in fact, the true nature of these tumors remained undiscovered. By several surgeons they were regarded as ranulæ, occurring as they do in the sublingual region. For example, Krabbel (25) reported a lateral dermoid of the floor of the mouth as "eine tiefe Atheromcyste am Halse mit Ranula." By others they were considered as atheromatous cysts of the tongue (22) or neck. That these dermoid tumors were described as deep sebaceous cysts of the neck is readily understandable. Their contents are certainly very similar, yet their mode of development and histology differ greatly. It was Roser of Marburg (33), who in 1859 first called attention to the fact that many of the so called ranulæ and sebaceous cysts occurring at the base of the tongue were really epidermoid tumors. His theories soon found ardent supporters in Heusinger (21), Virchow (42), and Schede (34). Chiari (10), from an elaborate series of observations, came to the conclusion that while atheromatous cysts result from a plugging either of a sebaceous gland or a hair follicle, these dermoid tumors were an embryonal closing off of epidermal cells. Isolated segments of skin may cause the formation of these cysts. Kaufman (23), has shown that epidermis sewed into the deeper tissues of animals resulted in the rapid development of an atheromatous tumor. The traumatic epithelial cysts occurring in the hands of seamstresses are well known; they are probably due to the epithelial cells being implanted into the deeper tissues by pins or needles.

Mikulicz (29) stated that the origin of dermoids may occur in three ways: through a closure of body cavities in the mid line, through a closure of channels or clefts which during fetal life were covered with epithelium, or through the abnormal deposits of epidermis in the deeper tissues. Dermoid cysts of the floor of the mouth probably develop by any of the three methods. A full discussion of the embryological developments of the furrows and arches of the branchiogenetic system is not essential. Only those which enter into the formation of the floor of the mouth and the tongue will be described.

In the third week of embryonic life, coincident with the origin of the median anlage of the thyroid gland, a small elevation, the tuberculum impar of His arises from the ventral surface of an area between the mandibular and hyoid branchial arches. This has been described by Kostanecki (24) as an ectodermal derivative covered by two layers of epithelial cells. On either side of this, two lateral processes arise as elevations from the inner surface of each mandibular arch. These two lateral lingual eminences which are covered with pavement epithelium form not only the floor of the mouth, but by their fusion, the body of the tongue. As this happens, the tuberculum impar then practically disappears although abnormal remains of this structure may give rise to epithelial rests, the future building blocks of these dermoid cysts. These three structures blended form a large eminence, the so called unpaired anlage of the tongue. The posterior paired anlage which forms the root of the tongue, also appears in the third week as a thickening of the ventral ends of the two hyoid arches. These, by their enlargement and subsequent fusion with the anterior anlage, form the tongue. The line of fusion is seen often in the adult as a *V*-shaped furrow, the sulcus terminalis, in the apex of which is the foramen

[1] From the surgical service of Dr. A. V. Moschcowitz, Mt. Sinai Hospital, New York.

cæcum. This blind pouch lined with stratified squamous epithelium is what is left of the median anlage of the thyroid gland.

During the second month the papillated structure of the tongue becomes evident and the lingual duct appears. Vestiges of this important structure explain the origin of certain cysts of the tongue which some have wrongly considered as dermoids. The lingual canal as it develops in a vertical direction pulls down with it the external covering of the tongue, which consists of pavement epithelium and here and there ciliated cells. As a result, the canal is lined in part with pavement and in part with ciliated epithelium. In the fourth month the lingual duct is broad and branched and certain parts of it become disconnected to form isolated cysts which lie free in the mass of the tongue. In time these cysts begin to grow; Wenglowski (43) examined 30 embryos and found many such tumors. In an examination of 117 cadavers, the foramen cæcum and the lingual duct were noted in more than one-half of the subjects. In the majority of cases where the lingual duct existed, it was covered with pavement epithelium in its upper part, deeper down with ciliated cells often changing over again into the pavement type. Cysts of the tongue occurred in thirty-two subjects, the proportion between children and adult cadavers being essentially the same. It must be distinctly understood that the lingual canal is not a rest of the thyroid anlage, but is a distinct duct which occurs at a later period of embryonic life. The median thyroid anlage, although it vanishes very early after its appearance, may leave a definite spur of tissue in the depths of the tongue, the remains of the tractus thyroglossus. This can never give rise to dermoid tumors, as claimed by certain authors (6, 14). It may give rise to lingual thyroids. The rests of the thyroid anlage and of the lingual canal may occur simultaneously but the latter alone may give origin to the cysts of the tongue.

These tumors are lined either with ciliated or pavement epithelium; if the latter, their histological structure resembles the usual epidermal epithelium *per se*, except that it has few layers and no papillæ. The upper layers have a tendency to cornification. The contents of these cysts are thick and opaque, contain mucus and on microscopic examination show tissue detritus, fat droplets, and desquamated epithelial cells. The appendages of true skin, however, are never present. Clinically and in the gross, these cysts may resemble dermoids so closely that a microscopic examination of the wall may be the sole means of a differential diagnosis (Case 3).

There is one source and a very important one from which ectodermal epithelial tissue may be derived. It has been mentioned previously, that the first branchial arch gives rise to the mandible and the second to the hyoid bone. These arches at first are separated from each other by the "meso branchial field," first mentioned by Kostanecki. As each arch unites in the mid line with its fellow of the opposite side, the surface ectoderm might be drawn in and become pinched off, leaving epithelial rests posterior to the jaw, the hyoid, and the mylohyoid muscles. Wenglowski showed that at the beginning of the second month when the entire branchial apparatus as such disappears, it might leave ectodermal epithelial rests behind. These are usually found dorsal to and above the hyoid bone, the area occupied by the dermoids of the floor of the mouth. The great majority of these rests must probably disappear because of the growth and activity of the surrounding muscles, connective tissues and bone, and in addition, Woelfer (44) in his researches on the development and structure of the thyroid gland noted that certain numbers of epithelial masses observed during embryonic life vanished suddenly.

It must be granted then, that the majority of the dermoids of the floor of the mouth are probably derived from the sequestration of ectoderm during the closure of the first and second arches, some may develop from abnormal remains of the tuberculum impar, but their derivation from the lingual duct or the thyroglossal tract are impossible. These cysts must have the histological evidences of skin to be classified as dermoids. But, it must be remembered that just as there are certain areas of skin without hair follicles,

with few sweat or sudoriferous glands, so it is not unusual to find dermoids lacking in some of the appendages of true skin. Besides, from desquamation, the epithelium may be reduced to a few layers. As a rule, however, the cyst is lined with stratified squamous epithelium with a definite stratum corneum and stratum malphigii. Occasionally the stratum granulosum and stratum lucidum may be present. As a rule the pars reticularis of the derma is rich in elastic fibers, but the pars papillaris is either atropic or absent. While hair follicles may not be present, sebaceous and sudoriferous glands are usually evident in great numbers. Ordinarily, the wall measures 1 to 3 millimeters, and although of feeble thickness, it is rather resistant, for the capsule is made of a vascular fibrous connective tissue.

The contents of the cysts are characteristic; from these, a positive diagnosis may be made of an epithelium lined cyst. They are either white or yellowish in color with a consistency which varies from a thick soup to a solid cheese-like consistency, through which hair may be scattered. They are usually oily in nature and may have a rancid odor, similar to butyric acid. Were the contents to be examined microscopically, they might consist of desquamated epithelial cells, fat globules, cholesterin, and hair often of the lanugo type.

To aid in the proper understanding of the location and classification of these cysts, and their surgical approach, the anatomy of the floor of the mouth will be briefly reviewed.

The floor of the mouth may be considered as a hammock made by the mylohyoid muscles as they join in the mid line. This muscle arises from the mylohyoid ridge on the internal surface of the body of the inferior maxilla, as fibers run obliquely inward and slightly backward to be inserted into a median raphé and the upper border of the body of the hyoid. In the cradle thus formed the tongue and the sublingual glands are held. Re-enforcing the mylohyoid muscles are two of the extrinsic muscles of the tongue arising from the mesially placed genial tubercles on the internal surface of the mandible. The inferior tubercles give origin to the geniohyoid muscles which are inserted into the hyoid bone below. The superior group to the genioglossi muscles are inserted into the body of the tongue above. To either side of the tongue then, between it and the mandible, there is a horseshoe space which harbors the sublingual gland, the sublingual branch of the lingual, the submental branch of the facial arteries, and the ranine veins. The bow of the horseshoe is limited and divided anteriorly by the frenum, a fold of mucous membrane which runs from the inferior surface of the tongue to the alveolar margin of the gums. To either side of the frenum are the carunculæ salivares, the openings of Wharton's duct. These canals run at first between the mylohyoid and sublingual glands and then between the latter and the genioglossi muscles. This duct is crossed by the lingual nerve as it runs anteriorly to supply the buccal mucous membrane. These various relationships are of importance in the surgical extirpation of these tumors.

Barker (2) divided dermoids of the floor of the mouth into the median and lateral varieties, the lateral into the unilateral and bilateral types. It is very doubtful, however, whether bilateral cysts occur. They have never been reported. It is readily conceivable that the frenum of the tongue above and the median raphé of the mylohyoid below may cause a cyst to be subdivided and thus give the impression of two (37).

Streickheisen (38) divided these tumors according to their position in relation to the hyoid bone, namely, præ, supra, epi, and intra-hyoid. This is fairly good as far as hyoid (lingual cysts) are concerned, but these, as has been stated are an entirely different group of tumors. Gerard Marchant (28) in 1886 collected 30 cases from the literature and divided them into two groups: those which had an attachment to the mandible and those which were adherent to the hyoid. The one he called the "kystes dermoids, ad geniens," the other, "kystes dermoids, adhyoids." This classification has one great objection and a very valid one: there is a large number of cysts which are neither connected to the genial tubercles or to the hyoid. In fact, Debonnelle (12), in his very excellent thesis,

mentions twenty-five cysts which had no bony adherences whatsoever.

Lannelonge (26) was the first to classify these cysts anatomically, and following him, Debonnelle divided them into the median and lateral varieties. The former are by far the more common, the latter rare and unusual. In fact, some doubt whether these, as such, actually exist, and raise the question whether they might not be the median variety which have migrated toward the right or left. The median cysts are subdivided into the geniohyoid cysts, those resting upon the mylohyoid muscles (Fig. 2), and spreading the fibers of the geniohyoid muscles apart, and the genioglossal cysts (Fig. 3), resting upon the geniohyoid muscles, pushing the genioglossi apart. The latter variety come more into contact with the tongue itself; hence they have been called sublingual dermoids. As they grow, these tumors may extend more in one direction than in the other or equally in both. The lateral tumors occupy the region above the mylohyoid, beneath the mucous membrane of the mouth, between the latero-inferior aspect of the tongue and the ramus of the lower jaw. These cysts described by Bazy (3), inferior to the mylohyoid, in fact subcutaneous, cannot be considered as belonging to the floor of the mouth.

There is no doubt that the majority of dermoid tumors must be congenital, and this is not altered by the fact that many do not develop until late in life. Instances of infants born with these tumors have been recorded (8, 17, 30), but their presence at this early age rarely causes any symptoms. The great majority of cases, however, occur between the ages of 12 and 25. During this period, there is an increased activity of epithelial tissue, an increased growth of hair, and an increased activity of both the sweat and sudoriferous glands. In the final analysis, these dermoid cysts are lined with the same epithelium which covers the body and that which stimulates the skin, probably stimulates these epithelial rests to cellular activity. Verneuil and Clado, (41) thought that the sudden growth of previously quiescent tumors in the adult might be accounted for by a low grade bacterial infection which by suppuration caused an increase in their size. But the contents of these cysts always proved to be sterile after careful bacteriological studies.

Clinically, these tumors are interesting, and while three groups will be described, the genioglossal, the geniohyoid and the lateral, it should be borne in mind that when these tumors increase in size, they merge interchangeably.

Those of sublingual or genioglossal group are felt as small lumps under the tongue in the region of the frenum between it and the alveolar margin of the incisor teeth. When small they cause no symptoms. As they grow larger the mucous membrane of the floor of the mouth is elevated, and with it the tongue is raised causing the mouth to be kept open. Then speech becomes altered, mastication and deglutition difficult. In fact the patient may complain of the constant dribbling of saliva, and the inability to ingest any solid food whatsoever. In some instances, especially on slight exertion dyspnœa may result, due to the pressure exerted upon the epiglottis.

The geniohyoid group of dermoids manifests itself by the appearance of a painless swelling in the submental region (Fig. 4). This may cause so little discomfort that the patients may not be aware of the swelling until their attention has been called to it. The mass is slow in developing and as it increases in size, it fills out the submental region, reaching from the mandible to the hyoid, giving the appearance of a double chin. Later it may push the larynx downward, and by its growth upward may cause a bulge into the floor of the mouth.

The lateral variety are very similar except that the swelling appears under the horizontal ramus of the lower jaw, and as it expands, it grows downward to the hyoid bone or presses the floor of the mouth upward, elevating the tongue and pushing it to the opposite side.

Pain in all varieties is unusual and it is not present unless the lingual nerve is pressed upon.

These tumors may perforate through the floor of the mouth (5, 18), the tongue (4), as in our case and that of Furnival, or even the

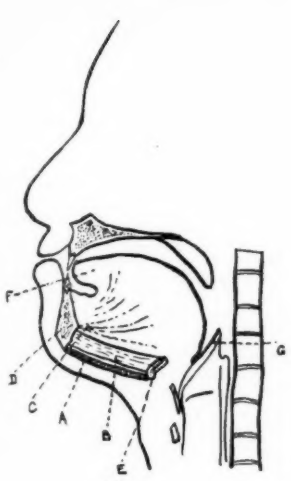

Fig. 1.

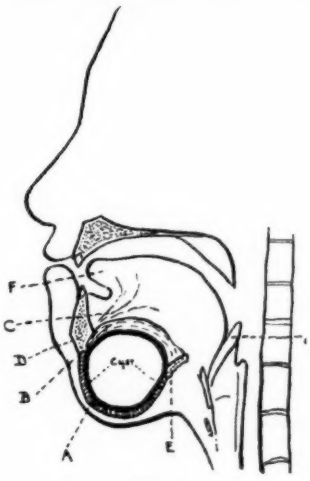

Fig. 2.

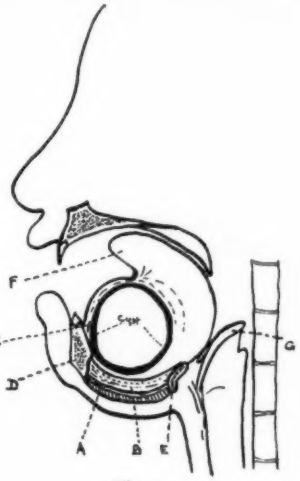

Fig. 3.

Fig. 1. Sagittal section of head. A, Mylohyoid muscle; B, geniohyoid muscle; C, genio-glossus muscle; D, mandible; E, hyoid bone; F, tongue; G, epiglottis. (After Piersol.)

Fig. 2. Submental or geniohyoid dermoids.
Fig. 3. Sublingual or genioglossal dermoids.

neck (39). In those cases invariably, the history of the mass which finally ruptures, and the nature of the contents should certainly lead to the correct diagnosis. The fistulæ thus formed may persist or may heal with the subsequent refilling of the cyst.

On physical examination, the tumor is soft, cystic, or elastic, and round, oval, dumbbell or kidney shaped. Its capacity varies from a few cubic centimeters to one which may contain 1200 cubic centimeters of fluid (19). The overlying skin is normal in color and texture and freely mobile. The dermoid itself may be movable in all directions and on the deeper parts, unless attached to the genial region of the mandible, to the hyoid bone, or the thyrohyoid membrane. This observation may be verified by requesting the patient to swallow, carefully noting the movement of the cyst with the hyoid bone. In addition the mass may be balloted between the floor of the mouth and the suprahyoid region. Fluctuation is present unless the mass is very tense. Some authors claim that because of the semisolid contents of certain cysts, if sufficient pressure is made, the palpating finger may leave a definite imprint similar to the "pitting" observed in œdema.

If the mass protrudes into the buccal cavity, the mucous membrane, although elevated will be healthy in general appearance. In rare instances it may have a feeble yellow hue, due to the color of the contents beneath shining through. The position of the tongue varies according to the size and location of the tumor. It is invariably pushed upward and backward, pressing upon the hard, and later upon the soft, palate. In the lateral dermoids the tongue will be pushed toward the opposite side. Occasionally it is invisible, and is obscured entirely by the cyst. From continual pressure, there may be a change in the position of the alveolus of the lower jaw, and the lower teeth may assume a position which may be almost horizontal. The openings of the salivary glands are normal, and their functional activity can be easily tested by application of vinegar to the carunculæ.

In these cases of perforation, scars may be visible marking the point of rupture, or possibly a fistula may be present. These are very difficult to probe, but by pressure in the region of the swelling, some of the contents may be expressed through the sinus tract and a microscopic examination made of the discharge.

Exploratory puncture will usually make the diagnosis for aspiration of the characteristic sebaceous contents point either to a dermoid or lingual cyst. These tumors cannot be differentiated clinically, only pathologically. This is strongly substantiated by Case 3, which clinically presented all the evidence of a geniohyoid dermoid, even to the characteristic sebaceous contents. A careful pathological examination of the wall disclosed stratified squamous epithelium without any of the appendages of skin. In all probability the cyst was derived from the lingual duct. (See Cases 22, 24, and 26.)

These tumors must be differentiated from others occurring in this region, namely, angioma, lipoma, and ranulæ. Angioma, as a rule, may be recognized by the dilatation of the veins of the mucous membrane and the absence of the positive physical findings of dermoid. Lipomata, as a rule, are less encapsulated, less movable, never smooth, and appear infiltrating the floor of the mouth. Ranulæ, which are congenital, are bluish in color, are not adherent to the hyoid bone, occupy a lateral position and transmit light. It is not necessary to differentiate dermoids from acute inflammations or carcinomata of the floor of the mouth. The differential diagnosis is self evident.

The treatment of dermoid cysts of the floor of the mouth is surgical. The antiquated methods of aspiration (22, 25), or aspiration combined with chemical irrigations to destroy the lining membrane, or the incision of these cysts followed by curettage of the cavity should no longer be used. Aspiration is only indicated in those neglected cases where the cysts have reached such proportions that by their mechanical bulk (5, 40) they exert pressure on the larynx causing asphyxia. This is only to be used then as a medical means preliminary to surgical interference. Extirpation of the cyst is the only procedure, and in order to prevent recurrence, the cyst must be excised *in toto*. The method of approach varies. There has been much discussion in the past as to what constitutes the ideal surgical approach, through the mouth—the buccal route—, or through the neck—the suprahyoid route. There can be no one way. Both have their indications, their difficulties, their advantages. The size and anatomical location of the cyst should be the deciding and determining factor. The buccal route has a real indication in those cysts which are genioglossal, be they small or large. If the cyst is small it may be excised without any difficulty at all, being adherent only, possibly, in the region of the genial tubercles. If large, there is always some danger of asphyxia, especially if general anæsthesia is employed. Local anæsthesia is always to be preferred wherever possible. If general anæsthesia is necessary, a traction ligature should be placed through the tip of the tongue and a tracheotomy set be prepared to meet the embarrassing complication of laryngeal obstruction (40). The incision into the floor of the mouth should be median, between the two carunculæ of the submaxillary salivary gland, from the inferior surface of the tongue, downward and forward toward the alveolus. In this way the blood bed of the floor of the mouth is practically avoided. With the division of the subcutaneous tissues, and the separation of the genioglossi muscles to either side, the wall of the cyst will become apparent. Then, by dividing the adhesions which may attach it to the genial tubercles, it is easily enucleated. If the tumor is large, these muscles may be so atrophic that the cyst wall appears to be submucous in position. The hæmorrhage may be easily controlled by ligatures or packing. Within recent years some surgeons have sutured the operative incision in the floor of the mouth without drainage, instead of permitting the wound made to heal by secondary intention. In those cases in which there was a possibility of a large dead space, a counter-incision was made in the suprahyoid region, thereby draining the sublingual area. This does not seem to be sound surgical procedure. There is always great danger of contaminating the tissues in the suprahyoid region with the bacterial fauna of the floor of the mouth, resulting in a foul infection.

For cysts which are geniohyoid, which are attached to the hyoid bone and cause swelling in the submental region, an incision through this area of the neck is highly preferable. The objections to it are more fanciful

than actual. It has been argued that it leaves a disgusting, disfiguring scar and that exposure is poor because the operation is performed in a deep hole. The scar need not be terrible, for there is no reason why these cysts cannot be removed through a transverse incision under the chin through a normal flexion crease rather than through a median incision from the chin to the hyoid bone. If insufficient exposure is obtained by dividing the raphé of the mylohyoids, these muscles may be divided at right angles through their fibers with perfect impunity, as long as the muscles are sutured again, at the conclusion of the operation. Then the geniohyoid muscles may be divided in the middle line, the adhesions which bind the cyst to the hyoid bone, or the thyrohyoid membrane may be cut and the cyst enucleated. If the geniohyoid muscles are cut at right angles to their fibers, a definite functional impairment of the tongue may occur. While it is true that this disappears in time, it certainly causes great annoyance to the patient, especially in speech. If the cyst removed has been small, the wound may be sutured without drainage. If a large space is left, a rubber dam drain for a few days is a safer procedure.

Tumors which are definitely lateral can best be reached by an incision parallel to, and beneath the horizontal ramus of, the jaw, and then, after splitting the mylohyoid muscles at right angles to its fibers, the tumor may be reached and excised without difficulty. Care should be taken, however, not to injure those important anatomical structures which lie in close proximity to the mesial side of these tumors.

These cysts, whether they are removed through the mouth or neck, rarely present any difficulty. The indication for splitting the lower jaw in the middle line seems almost unnecessary (5). Occasionally when dividing adhesions, attaching the cyst to the hyoid bone or the hyoid membrane or from manipulating the larynx, dyspnœa may result, necessitating tracheotomy.

The only difficult cases are those complicated by fistula which connect these tumors either with the floor of the mouth or with the tongue. The reason these are difficult is that the cyst itself has drained its contents by way of the fistula; it is, therefore, small, and because previous attempts have been made to remove it, or because of secondary infection, scar tissue obscures the operative field. A probe introduced into the fistula may be of aid, but the tract is so delicate that it is very easy to make a false passage with this metal instrument and be misled, rather than aided. Injection of the sinus with methylene blue or bismuth did not prove practical in our case. The real guide is a careful history as to where the tumor made its first appearance, whether in the mouth or in the submental region, lateral or median. And then, with its prime location as a clue, to look for it in the usual anatomical location.

REPORT OF TWO CASES OF DERMOID CYST OF THE FLOOR OF THE MOUTH AND ONE CASE OF LINGUAL CYST FROM THE SURGICAL SERVICES OF THE MOUNT SINAI HOSPITAL, NEW YORK.

CASE 1. F. L., No. 236854, 7-9, Italian, aged 21 years, single, admitted to hospital December 4, 1923, to service of Dr. A. V. Moschcowitz; discharged December 29, 1923. At the age of 8 the patient noticed a swelling under the tongue which increased so in size that she was unable to swallow or talk. This mass ruptured spontaneously and discharged a thick pus (?). The perforation was in the floor of the mouth. She then remained well until 1921. In December of that year, the swelling again appeared and the tongue became elevated. At the end of 10 days an incision was made into the floor of the mouth liberating pus. Two months later the mass again appeared and an incision was again made in the floor of the mouth in the same place. This healed up and remained well for 2 months when there was a recurrence. This time an incision was made externally beneath the mandible with the liberation of some pus (?), and the wound healed within 10 days. Within 7 weeks there was a recurrence of symptoms, she was operated upon through the old external incision and the wound was drained for 2 weeks and finally healed. Eight weeks later she had another recurrence which was again incised, healing within a very short time. Two months later the mass again appeared and an incision was made through the old scar in the right submaxillary region with the evacuation of pus (?). A tube was kept in for 6 months, the patient injecting boric acid daily through the tube. In doing this she noticed the boric acid in her mouth and methylene blue injected through the neck wound appeared on the surface of the tongue. With the removal of the tube, the

wound of the neck healed. Since then there has been occasional discharge either by a reopening of the neck wound or from the surface of the tongue.

Physical examination was negative except for the surgical condition. There is no scar tissue evident in the floor of the mouth but in the mid line of the anterior third of the tongue there is a small sinus which admits a probe. This passes downward and anteriorly for a distance of about 2 inches. The contour of the buccal cavity appears normal. On the right side of the neck parallel to the mandible is the scar 1 inch in length and keloidal. This is healed. Pressure in this region causes the discharge of brownish curdy material from the lingual fistula.

Operation was performed by Dr. A. V. Moschcowitz and gas and ether was used for the anæsthetic. A 4 inch transverse incision was made about an inch above and parallel to the hyoid bone excising the former scar. The mylohyoid muscle was incised transversely to its fibers. A probe was introduced in the tongue and unfortunately a false passage was made which led into the region of the hyloglossus muscle. Upon cutting through the geniohyoid and genioglossi muscles a fibrous tract was found leading upward toward the mid line of the tongue. This led just under the symphysis to a small cyst which contained an occasional hair and which was about the size of a pea. Scar tissue connected this with the sinus tract opening up on the dorsum of the tongue. This was excised and the opening in the tongue was sutured with plain gut. The three muscular layers of the floor of the mouth were sutured with interrupted plain and chromic catgut sutures. The skin was closed with silk and pincets and a rubber dam was inserted.

Postoperative course was uneventful. Pathological report by Dr. F. S. Mandlebaum. Specimen removed from the tongue of F. L. was received in formalin. One portion of the specimen was partially covered with mucous membrane and the remainder of the tissue was composed of muscle fibers. A cross section through the specimen reveals near the central portion a structure of a different character. Microscopical examination shows the latter to be made up of a thick layer of squamous epithelium beneath which is a definite zone of sebaceous glands. The free surfaces of the epithelial lining are in close opposition leaving but a narrow cleft, evidently the effect of compression by the surrounding muscle fibers. Diagnosis: dermoid cyst. (No. 52817.) (Figs. 4 and 5, slide No. 27625.)

Patient was seen March 24, 1924, at which time she was completely healed. She still had some difficulty in protruding her tongue but her speech was absolutely perfect.

CASE 2. S. T., No. 165361. Russian, age 15 years, single, female; admitted to hospital July 19, 1916, to the surgical service of Dr. Howard Lilienthal; discharged July 27, 1916. Two years ago the patient noticed a small lump on the under side of the chin in the mid line. This has grown very slowly and has caused no symptoms.

Physical examination was negative except for surgical condition. Examination of the mouth reveals no abnormality. In the mid line of the neck just below the inferior maxilla is an elastic cystic swelling about the size of an English walnut, which is freely movable and not tender.

Operation was performed by Dr. J. Wiener, and gas and ether were used as anæsthetic. A transverse incision was made 1 inch above the hyoid bone, the mylohyoid was incised, the geniohyoid retracted, and a cyst the size of a walnut was easily extirpated. Uneventful recovery.

Pathological report by Dr. F. S. Mandlebaum. Section shows a cyst wall composed of rather dense fibrous tissue showing in one situation a narrow zone of muscle fibers cut transversely. The inner surface is covered by a layer of stratified squamous epithelium beneath which are found islands of typical sebaceous glands. Diagnosis: dermoid cyst. (Fig. 6, slide No. 18388.)

CASE 3.[1] G. S., No. 211701, 13-3, Russian, aged 34 years, single; admitted to hospital July 12, 1921, to the surgical service of Dr. A. A. Berg; discharged July 21, 1921. For the past 6 years patient has noticed a small mass underneath the chin which has been growing very slowly and without pain. For the past year it seems to have grown more rapidly in size. There is no history of any difficulty with speech, no interference with deglutition or respiration. The past and family history are irrelevant.

Physical examination was negative except for the surgical condition. Beneath the tongue and in the mid line there is a large, tense cystic tumor which elevates the tongue to the roof of the mouth. The mucous membrane is normal in color and appearance. When the mouth is closed and the jaws are brought together, the tumor appears in the submental region as a mass about the size of an apple. It is not tender. There are a few superficial cervical glands palpable and the isthmus of the thyroid is definitely felt. (Fig. 7).

Operation was performed by Dr. Richard Lewisohn with gas and ether as an anæsthetic. A transverse incision was made which was deepened through the mylohyoid muscles, and the tumor was dissected out without any difficulty. It was found to be a cyst about the size of an apple and to contain much cheesy material. The wound was drained by a tube for a few days. Uneventful recovery.

Pathological report by Dr. F. S. Mandlebaum. Section shows a cyst wall composed of loosely bound connective tissue fibers, somewhat vascular in character and in some situations the vessels form dilated sinuses. The covering is made up of a layer of stratified squamous epithelium, the superficial cells of which are actively desquamating. There are no skin appendages such as hair, sebaceous or sweat glands seen. Diagnosis: epithelium lined cyst. (Fig. 8, slide No. 24215.)

[1]This case is presented because clinically it was regarded as a dermoid of the floor of the mouth, until a very careful examination of the cyst wall failed to show any of the appendages of true skin. It probably is a lingual duct cyst.

ABSTRACT OF CASE REPORTS

Records of 32 cases of dermoid cysts of the floor of the mouth, not included in the collection of Debonnelle (1908). Nine cases marked (†) were reported as dermoids but were not accompanied by a pathological report of the cyst wall. Five cases marked (*) are accompanied by a pathological report, but the histological evidence points to origin in the lingual duct rather than in the dermoid.

BARBAUD (1). Female, age 10 years. Horseshoe mass lifting up the mucous membrane of the floor of the mouth. Openings of salivary glands normal.

Operation was done through the buccal route. Incision was made through the genioglossal and geniohyoid muscles and a tumor adherent to the hyoid bone was extirpated. The case was reported as a dermoid.

BARKER (2)*. Female, age 20 years. Patient had a small lump on the right side of the jaw which for the past 9 years has increased gradually in size without symptoms.

Physical examination disclosed, in the right submaxillary region, a soft tumor which reached from the angle of the jaw to the mid line and touched the hyoid bone below. When pressed from below it bulged into the floor of the mouth.

Operation was performed through a median suprahyoid incision. After skin, mylohyoid, and geniohyoid were divided a cyst was found to the lateral side of the genioglossal muscles between the hyoglossal and the mylohyoid.

Pathological report. Cyst sausage shaped with a very thin wall with friable pultaceous contents.

Microscopic examination showed a capsule of fibrous connective tissue with a thick layer of stratified epithelium, the surface cells of which were degenerated; there was no hair.

BERARD (4). Female, age 36 years. At the age of 22 patient noticed a median tumor in the submental region, which gradually extended into the moutb raising up the tongue and causing difficulty in speaking and deglutition. It became as large as a hen's egg. At times it seemed to become very much smaller, and twice it ruptured into the suprahyoid region, with the evacuation of a milky fluid. These fistulæ healed spontaneously. For the past 2 months, it has increased rapidly in size. At present there is a tumor the size of a fist in the suprahyoid region, which extends from the parotid region to the anterior border of the sternomastoid, below almost to the clavicle. It appears separated from the thyroid gland. It is soft and fluctuates. Below, the skin covering it is red and thin as though it is ready to ulcerate. Within the buccal cavity a projection is seen to the right side, raising up the floor of the mouth. The tumor seems to be adherent to the hyoid bone. Aspiration showed sebaceous like material.

Operation was performed through a low transverse incision. The wall broke and sebaceous material was evacuated. Above, the cyst is slightly adherent to the sublingual gland and buccal mucous membrane; below, it is adherent to the hyoid bone by dense fibrous adhesions. Uneventful recovery.

Pathological report Dermoid cyst.

BRENTANO (5). Male, age 28. For the past 4 years patient has had a persistently discharging fistula from the floor of the mouth.

Operation was performed through incision in the submental region. The sublingual gland and ducts were found intact, but above and behind this there was a swelling which was incised with the evacuation of a foul smelling detritus. The wound was drained and finally healed. Two months later there was a recurrence.

A secondary operation was performed and the lower lip and jaw split. A small tumor was extirpated from between the tongue muscles. This tumor was not connected with the jaw or the hyoid bone. The jaw was sutured with silver wire. Eight weeks later the wire sutures were removed, and a perfect anatomical and functional result was secured.

Pathological report. Dermoid cyst.

BREWER (6). Female, age 35 years. For the past few months patient noticed a mass under the middle of the lower jaw, which has increased gradually in size, but patient has not suffered pain. There has recently been difficulty in deglutition and embarrassment in respiration.

Physical examination shows the mouth open and saliva dribbling. The tongue is lifted to the roof of the mouth. Between the lower jaw and the hyoid bone is a large oval tumor.

Operation was performed through a median suprahyoid incision. The mylohyoid muscle was split and a tumor was found between the geniohyoid muscles. But the tumor could not be delivered through the opening. A semilunar incision was then made through the floor of the mouth, and the tumor pushed through with difficulty. At one time it was thought that the lower jaw would have to be split in order to deliver the mass.

Pathological report. Tumor measured 7 inches in circumference, and was reported as a dermoid (thyroglossal)

BUCHANON (7)*. Female, age 21 years. For the past 3 years the patient has felt a soreness of the tongue with a mass developing on the floor of the mouth and a fulness becoming apparent under the jaw. This was incised three times before the present operation.

Physical examination showed on either side of the frenum of the tongue, a swelling more pronounced on the right than on the left side. This was incised with the evacuation of sebaceous material. The cyst wall was then excised.

Pathological report. Contents, flat epithelial cells in various stages of degeneration.

CHALIER (9). Male, age 23 years. For past 6 years patient has noticed a mass below the tongue and behind the frenum which has been increasing in size until it is as large as a mandarin.

Physical examination reveals a tumor, with yellow transparency under the mucous membrane. The swelling fluctuates, and extends below the jaw to the hyoid bone.

Operation was performed by excision through the buccal route. The tumor was attached to the hyoid bone.

Pathological report. Tumor contained hair. No histological examination.

CHALIER (9)†. Female, age 31 years. Patient had a mass in the submental region which first appeared when she was 17 years old. For past year it has increased suddenly in size, extending more to the right than to the left.

Operation was performed through a median suprahyoid incision, the right mylohyoid was incised, and enucleating the cyst, it ruptured and a butyric acid material escaped. The postero-inferior part of cyst was adherent to the body of the hyoid bone by fibrous pedicle.

DAMBRIN (11). Female, age 20 years. For the past 5 years there had been present a tumor the size of a nut situated at the base of the tongue. During past year, the tumor has grown to the size of a hen's egg, and projects beneath the maxilla. Patient has difficulty with speech, but deglutition is normal.

Physical examination shows a suprahyoid tumor, which is freely movable, soft in consistency, but without fluctuation. The mass projects into the mouth, is yellowish in color, and the tongue is lifted up against the roof of the mouth.

Operation was done through a median suprahyoid incision, through mylohyoid raphé, and cyst found between the two geniohyoid muscles was easily excised. Drainage. Uneventful recovery.

Pathological report. Contents similar to sebaceous cyst, cyst wall true skin.

DUVERGEY (13). Male, age 16 years. For the past 10 months, patient has noticed a tumor underneath the left jaw, which has increased to the size of a hen's egg.

Physical examination shows a tumor mass extending beneath the left lower jaw from the sternomastoid almost to the mid line, raising up the left side of the tongue, and fluctuating. It appears to be translucent and seems to have a bluish color. Therefore a diagnosis was made of ranula.

Operation. An incision was made through the floor of the mouth, and whitish sebaceous material was evacuated. The cyst which was found adherent to the genial tubercle was excised.

Pathological report. The cyst wall was lined with epidermis, papillæ, and hair follicles.

ERDMAN (14). There is a very brief report of a so-called thyroglossal dermoid which was removed through the buccal route after an unsuccessful attempt to remove it through a submental incision several months previously.

FERGUSON (16)†. Male, age 40 years. There had been gradual development of a tumor in the floor of the mouth, and in the suprahyoid region. It was impossible to close the lips and to masticate. Breathing was difficult.

Physical examination showed a tumor underneath the tongue, pressing the tongue upward against the palate, so that only the tip was visible.

Operation. An incision was made through the mouth liberating a thick curdy material, not unlike that found in a sebaceous cyst. This was followed by an incision in the suprahyoid region with excision of the sac. The case was followed for 4 years and the patient has remained healed.

FERGUSON (16)†. Female, age 20 years. The history is recorded of an operative procedure similar to the one above. No details of the case are given.

FLINN (17)†. Male, age 29 years. Since birth a small tumor the size of a Spanish nut beneath the tongue had caused no inconvenience except difficulty in articulation. In the past 8 months it had become suddenly larger causing dyspnœa and cyanosis.

Physical examination revealed a tumor filling the entire cavity of the mouth, pushing itself upward and backward, projecting beneath the jaw into the submental region. The mouth part fluctuated.

At operation the cyst was aspirated and 15 ounces of thick creamy material was withdrawn. This was repeated on three separate occasions. Finally the cyst was incised and 4 ounces of thick brown material evacuated, and the cyst wall curetted. The cavity was packed, but suppurated for a long period of time.

FURNIVAL (18)*. A male, age 42 years, had a swelling under the tongue for a year and a half. This was incised and cauterized and discharged intermittently. An ill defined lump remained and projected underneath the tongue, between its tip and the floor of the mouth. This tract led downward toward the hyoid bone, and was lined with stratified squamous epithelium.

WELLINGTON GRAY (19). A male, age 35 years, for the past two years had a small nodule under the tongue which increased gradually in size, finally reaching the size of a cocoanut protruding from the mouth. It measured 14 inches at the lips, and 7 inches from tip to base. It completely filled the space between the jaws. The upper incisor teeth were horizontal, and the fangs of the lower teeth pointed upward. There was a swelling in the neck as low as the thyroid cartilage.

Operation. An exploratory puncture was made through the mouth and 40 ounces of the sebaceous material was evacuated. The incision was enlarged and the cyst found between the genioglossi attached to the hyoid bone.

Pathological report. The contents were epithelial cells, cholesterin crystals and fat. The cyst wall was similar to cutaneous epithelium.

GREEN (20).† A male, age 31 years, at the age of 10 had noticed a lump under the tongue, the size of a bird's egg. His attention was first called to it by some friends who thought he had a piece of candy in his mouth. At the age of 22 years, the mass grew larger and for the past 7 years his mouth had always been open. Speech was difficult and recently respiratory stridor had developed.

Physical examination. The floor of the mouth was pushed up by the tumor mass, and the tip of the tongue was visible opposite the soft palate. There was a mass from the chin to the hyoid which fluctuated.

Operation. A traction ligature was passed through the tongue. A median incision was made down through the genioglossi, and the tumor extirpated.

HULKE (22).† A female, age 23 years. A tumor had gradually developed in the right side of the mouth pushing the tongue upward and to the left, making speech and swallowing difficult.

Physical examination. The tumor was on right side of the floor of the mouth, attached to the symphysis of the jaw and extended into the suprahyoid region to the cricoid cartilage. Fluctuation was present.

Operation. The incision was made through the mouth. Stinking putty-like material was liberated. This was followed by inflammation which because of the severe dyspnœa necessitated further incisions. After suppurating for 5 months, the condition healed.

KRABBEL (25)†. A female, age 24 years, since the age of 4 years, had had a swelling in the neck, which had increased gradually in size.

Physical examination. On the right side of the neck under the lower jaw, extending to the thyroid cartilage, there was a fluctuating mass, which protruded into the mouth, and pushed the tongue to the opposite side.

Operation. Through an incision parallel to the lower jaw, the cyst was incised, and 200 cubic centimeters of thick fatty material were evacuated. The cyst was not entirely removed, but the walls were sutured to the skin and were injected daily with iodine. A fistula developed which gradually healed.

LEGRAND (27)*. Child, age 6 years. At birth a tumor was noticed in the floor of the mouth, which had gradually increased in size, so that the lips could not be closed and the tumor protruded between the teeth. Speech was indistinct.

Physical examination. The incisor teeth had been shed from pressure and the alveolar margin of the jaw displaced. The frenum of the tongue was ulcerated.

Operation. The tumor was extirpated through an incision in the floor of the mouth. It was hour-glass in shape, central to and between the muscular tissues of the tongue, extending backward and adhering to the hyoid bone.

Pathological report. The wall was thin and semitranslucent. The gruel-like contents on examination showed fat, epithelium, cholesterin crystals, mucus, and triple phosphates.

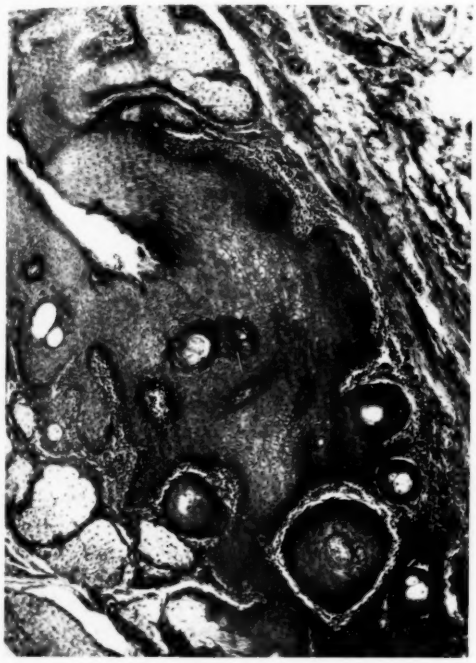

Fig. 4. Photomicrograph (low power) of Case 1, showing blind end of fistula ending in dermoid cyst. Lining composed of stratified squamous epithelium with definite layer of sebaceous glands.

Fig. 5. High power of section of Figure 4.

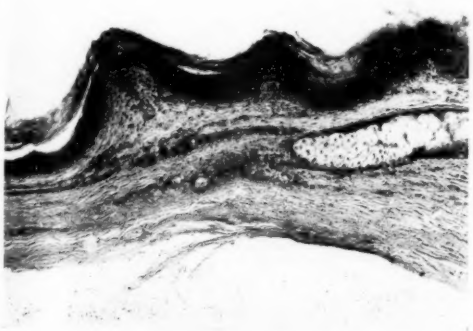

Fig. 6. Photomicrograph (low power) of cyst wall of Case 2 showing lining of stratified squamous epithelium with marked cornification of superficial layers and one zone of sebaceous glands.

Fig. 7. Photograph of Case 3, showing the deformity typical of dermoid cyst of the submental or geniohyoid variety.

Fig. 8. Photomicrograph (low power) of cyst wall of Case 3, showing cyst lined with stratified squamous epithelium with marked desquamation.

OLLERENSHAW (30). Male, age 13 years. At birth a small tumor the size of a pea was noticed in the floor of the mouth. At the age of 12 this grew rapidly, and finally the boy was unable to close his mouth, and swallowed with difficulty.

Physical examination. There was a tumor in the floor of the mouth pressing the tongue up against the upper incisor teeth.

Operation. The tumor was extirpated by the buccal route. It was reported as a sequestration dermoid.

RICHARDS (32).* Female, age 21 years, had noticed since the age of 6, in the suprahyoid region, a small tumor the size of a hazel nut which had increased gradually in size. There were no symptoms.

Physical examination. In the suprahyoid region there was a small round tumor. The overlying skin was normal.

Operation. Extirpation was effected through the median suprahyoid route.

Pathological report. The contents were squamous cells in fatty degeneration, and fat. The cyst was lined with stratified squamous epithelium.

SCHNITZLER (35).† Male, age 31 years. For the past two weeks, the patient had noticed a mass developing under the tongue which caused difficulty in swallowing.

Physical examination. Under the tongue, there was a fluctuating tumor, which had pushed the tongue backward.

A diagnosis of ranula was made.

Operation. A median incision was made through the mouth, liberating thick, atheromatous material. The cyst wall was carbolized and packed with iodoform gauze. Because of foul infection it became necessary to make counter incisions through the suprahyoid region which were packed with iodoform.

SCHNITZLER (35).† A male, age 26 years, for a year and one half had noticed a swelling in the floor of the mouth which had increased in size without causing any symptoms.

Physical examination. On the left side of the floor of the mouth between the alveolar margin and the tongue, pushing the tongue upward and to the right, there was an elastic soft swelling.

A diagnosis of ranula was made.

Operation. An incision was made through the floor of the mouth and atheromatous material was evacuated. The wound healed within 12 days.

SCHNITZLER (35). A female, age 22 years, for several years had noticed a tumor growing slowly in the floor of the mouth.

Physical examination. Under the tongue which was pushed upward and backward there was a fluctuating tumor which was not painful.

A diagnosis of ranula was made.

Operation. An incision was made through the mouth; sebaceous material was liberated and the tumor extipated. Uneventful recovery followed.

Pathological report. The tumor was made up of stratified squamous epithelium with many sebaceous glands but no hair.

SENN (36). A female, age 25 years, for the past four years had noticed a tumor under the chin, which had increased rapidly in size recently, causing difficulty in speech and deglutition.

Physical examination. A mass in the suprahyoid region the size of a goose egg, pressing the tongue upward, fluctuated and was painless.

Operation. A median incision was made through the buccal route and the contents evacuated. Extirpation without difficulty was followed by uneventful recovery.

Microscopic examination revealed a cyst of branchial origin (dermoid?). (Senn makes a distinction between branchial and dermoid tumors, stating that branchial cysts contain only the products of epithelial cells, because branchial cysts close before the appendages of the true skin are formed, whereas a dermoid is composed of skin with its appendages.)

STIEDA (37). A male, age 26 years, for the past few days had complained of difficulty in respiration and pain in the neck, due, he thought, to a tumor beneath the lower jaw which had been growing progressively in size for a long time.

Physical examination. In the submental region, there was a swelling the size of a fist, which extended to the hyoid and pushed the larynx downward. The mouth was open, the tumor visible, but the tongue could not be seen. The opening to the submaxillary and sublingual glands was normal. The mass fluctuated, and was soft and elastic. When the patient swallowed, the mass was seen to be made up of two goose-egg swellings, divided by and apparently beneath the mylohyoid muscles. This dermoid tumor was extirpated without any difficulty.

TIXIER (39). A patient, 29 years of age, at birth had a median whitish tumefaction at the base of the frænum of the tongue. Buccal intervention had been made for this condition, but there was no exact information as to what was done. At 13 years of age, suprahyoid intervention was made as there was a suprahyoid cyst. This intervention was followed by two others the same year, with a one-month interval, because the suprahyoid swelling grew again. At 20 years of age, there was sudden inflammation of the buccal floor and the suprahyoid region with dyspnœa and cyanosis. Operation was performed 24 hours after the onset of these symptoms. Four months' treatment followed. One year ago a new inflammatory process supervened at the same place. Intervention was made by both the buccal and suprahyoid routes. Following these, the patient showed marked adherence of the tongue to the buccal floor and two fistulæ, one cutaneous, suprahyoid and median; the other mucous, at the angle of the buccal floor.

Physical examination. The patient at entrance presented a median and right lateral tumefaction, filling up the free space between the right maxillary arch and the tongue.

The swelling was soft, pseudo fluctuating, the tongue very adherent to the floor. There was great difficulty in speaking and deglutition. Two fistulæ which discharged a seropurulent liquid persisted.

Operation. Radical intervention was made through a wide suprahyoid incision, in horseshoe shape, with a median vertical incision descending to the hyoid bone. The cutaneous fistulæ were circumscribed, and a fistulous tract dissected; this had penetrated into the buccal floor across the mylohyoid. The cyst had penetrated into the tongue toward the base. Complete extirpation was done.

Pathological report. Dermoid cyst.

TRUEMPER (40). A male, age 25 years, from early childhood remembered having a swelling under the chin. For the past 3 years it had gradually increased in size, with difficulty in swallowing, occasional dyspnœa, and sticking pain.

Physical examination. In the submental region in the mid line, there was a tumor, the size of a fist, extending from the hyoid bone to the maxilla. The lower lip was thickened, the alveolar margin was pressed forward, the skin over it was unchanged. The hyoid bone and larynx were pressed downward. During deglutition the tumor split into two masses divided by the median raphé of the mylohyoid. When the mouth was open, behind the teeth could be seen a yellow shining tumor the size of a goose egg. The tongue was not apparent. When the tumor was pressed downward the tip of the tongue could be seen and an increase in the size of the tumor in the submental region. The openings of the sublingual and submaxillary glands were normal. There was no fluctuation. The mucous membrane was normal. Laryngeal examination was impossible.

Operation. Chloroform anæsthesia was used. The mylohyoid, geniohyoid, and genioglossus were divided. The tumor was found lying deep, firmly adherent to the hyoid bone. During manipulation, asphyxia developed, so that the tumor was aspirated, and thick fatty yellow contents with several hairs were evacuated. Respiration became better, and the tumor was easily extirpated. Drainage was instituted and uneventful recovery followed, with perfect anatomical and functional result.

Pathological report. The contents were epithelial cells, elastic fiber, fat, cholesterin crystals, and hair. The cyst wall showed stratified squamous epithelium, papillæ, and sebaceous glands; the capsule showed many elastic fibers and was fairly vascular.

TRUEMPER (40). Female, age 30 years. The tumor began with a toothache and swelling of the mucous membrane under the tongue, so that movement of the tongue was impossible. After a few days the swelling disappeared and a small opening was noticed in the mucous membrane. Finally a swelling developed which in the past two weeks had grown so large that speech was difficult and dyspnœa ensued, but there was no pain.

Physical examination. Reaching from the chin to the hyoid was a tumor the size of an egg. It fluctuated and the skin over it was normal. The tongue was elevated and pressed backward toward the larynx. Under the tongue was a small scar. The mucous membrane and the opening of the salivary glands were normal.

Operation. Chloroform anæsthesia was used and a median incision made. Asphyxia developed almost immediately. The cyst was aspirated and emptied of its content, but the improvement in respiration was so slight that tracheotomy had to be performed. The cyst wall connected with the scar in the mouth. Uneventful recovery followed.

Pathological report. There were epithelial cells and cholesterin crystals. The cyst wall was of the structure of skin.

Two other cases are reported by Truemper; 1 in a girl of 22 years and 1 in a young man. In both the histological evidences indicated dermoids.

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PRIMARY ENDOTHELIOMA OF THE PERITONEUM

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From the Pathological Institute of McGill University, Professor Horst Oertel

WHILE primary tumors derived from the lining membrane of the pleural cavities, which may be classed as endotheliomata, are not uncommon, corresponding growths from the peritoneum demand greater attention not only on account of their rarity but because their endothelial (genuine peritoneal) derivation is by no means always easily established, and their strict separation from intestinal cancers or from misplaced embryonic gut rests is often attended with difficulty.

The instance here reported appears more straightforward than many others and by virtue of entire absence of secondary, confusing degenerations (serous, mucoid, colloid) made the anatomical diagnosis of a primary endothelioma or mesothelioma of the peritoneum most probable.

A 33/23, Mrs. J. V., age 49, was admitted to the Royal Victoria Hospital with the following complaints: thirst, obstinate constipation, swelling of abdomen, loss of appetite, loss of weight, nausea and vomiting.

Six months before admission the patient first noticed swelling of the abdomen which gradually increased. During this time constipation was marked and cathartics and injections were used, but in spite of these the constipation became more obstinate, and there had been only one movement in the last 4 days before admission.

A month before admission, loss of appetite, nausea and vomiting with pain in the right upper quadrant set in. At this time a slight yellowish tinge of the face was noticed. For 3 years increasing thirst had been marked and for 6 months there had been gradual loss of weight.

Personal and family history. The patient passed through a mild attack of typhoid fever 6 years ago. Otherwise there is nothing of importance.

Status præsens. The patient is a slightly undernourished female. She continually eructates watery sour fluid without any particular discomfort. The abdomen is full, pendulous and soft, but without rigidity, tenderness, or pain on pressure. There is movable dulness in both flanks. The patient suffers from night frequency (2 to 3); urine examination showed specific gravity, 1031; cloudy; sugar 2.2 per cent, blood sugar .4 per cent. There is moderate acidosis (Van Slyke 46 v).

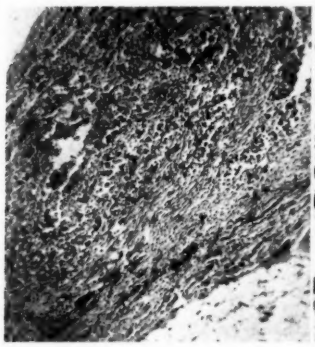
The day before death an exploratory laparotomy disclosed a large amount of bloody fluid in the peritoneal cavity with what was taken to be a generalized carcinomatosis of the peritoneum.

At autopsy the important findings centered within the peritoneal cavity. The thoracic organs presented no lesions, the abdominal viscera also showed no direct relation to the main lesion of a diffuse peritoneal growth.

The pelvis presented a very striking appearance. Its peritoneum was dense, white, opaque and diffusely thickened, resembling the characteristic sugar glazing. The rectum, bladder, uterus, and adnexa were compressed behind this thickened membrane. This infiltration and thickening extended out of the pelvic cavity and involved the parietal peritoneum of the lower abdomen, gradually becoming thinner, streaky, and patchy. On the mesentery the lesion appeared in the form of round, flat, white hyaline areas averaging 5 or 6 millimeters in diameter. The transverse colon near its midsection was surrounded by an irregular mass the size of a closed fist, its surface presented the same white hyaline thickening as that seen in the pelvis. When the colon was opened, the gut itself was found to be intact, but surrounded by a mass of fat, covered by thickened peritoneum.

This whole picture suggested the possibility of tuberculosis or carcinomatosis and further gross evidence of a primary focus was suspected. A very careful search for a primary growth was made. No tumor could be seen or palpated in the mammary glands or elsewhere in the exposed body. The abdominal viscera were grossly intact. As the lesion was most marked in the pelvis and in contact with the ovaries, they received special attention. These organs were small and atrophic, about the size of a marble and were covered, like the rest of the pelvis, by the thickened peritoneum. This peritoneal layer which here was about 2 millimeters thick could be separated from the ovarian parenchyma which it did not seem to involve to any appreciable depth. The gross examination also failed to show any evidence of a latent or active tuberculous focus.

Microscopic examination. Tuberculosis was immediately ruled out. It was also evident that the tumor did not conform with ordinary carcinomatous metastatic growths. Low



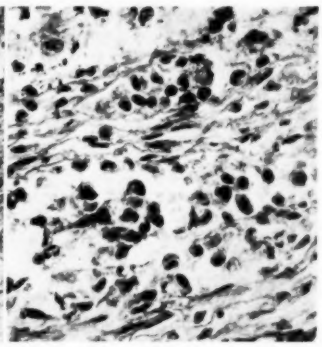


Fig. 1 (left). Pelvic peritoneum (low power) showing extensive fibrous thickening and cords and nests of cells.

Fig. 2. Pelvic peritoneum (high power) showing the uniform type of cell and the fibrous stroma.

power sections of the peritoneum (Fig. 1) showed that the growth was not seeded on the surface as is the case in the ordinary metastasis of cancer, but involved rather uniformly the inner layers with a dense fibrous thickening.

High power (Fig. 2) shows the growth to be made up of tumor cells, with abundant dense fibrous stroma. In this stroma cells grow in larger or smaller masses, either as solid cords in lymph spaces, or as small groups and individuals. Occasionally they line lymph spaces and are then directly attached to normal lining endothelium. The majority of the cells are of a more or less uniform size and type and generally resemble flat endothelial lining cells. They are, however, slightly larger than normal endothelial cells, contain a round or oval nucleus, which generally exhibits a uniform chromatic content. At times, however, the chromatin is in a network and with its nucleolus hardly varies from that of normal endothelium. In addition to this type of cell, multinucleated forms and large irregular cells with very bizarre nuclei are scattered throughout certain fields (Fig. 5). There is no approach to acinar arrangement except in so far as cross sections of lymph spaces lined by the tumor cells simulate such structures.

In the fat, surrounding the large gut, particularly in the mass described in the transverse colon, groups and masses of cells are seen growing in the lymph spaces of the fibrous trabeculæ. Here the cells are more uniform in type, and large irregular forms are absent.

The thickened peritoneum of the ovaries, which are about the size of marbles, is

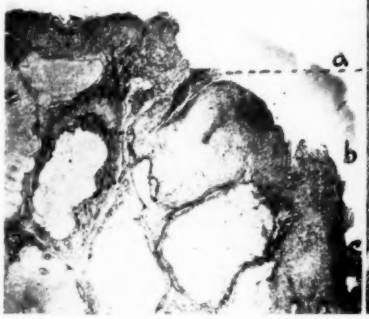


Fig. 3. Low power of section of ovary showing superficial invasion by tumor at *a*, *b*, and *c*.

Fig. 4. Higher power of ovary (Fig. 3, *a*) showing fissure filled with tumor cells.

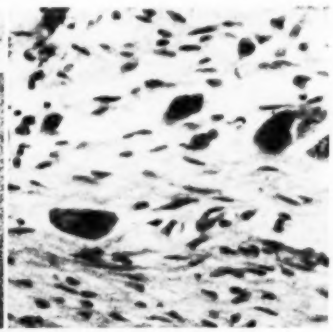


Fig. 5. High power showing irregular large cells with very bizarre nuclei.

stripped off to expose them and complete sections are made through the ovary (Fig. 3). The central part of the organ is largely occupied by corpora fibrosa. At the periphery is a dense stroma. There are narrow fissures extending downward from the surface (Fig. 4). At several points the ovary has been invaded by the growth and these points of invasion correspond to fissures (Fig. 4). From these, lateral invasion has evidently taken place to deeper involvement. The cell type here displays its greatest irregularity and large forms predominate. They are generally somewhat irregular in outline but with a tendency to an ovoid form. The nuclei are large, round or oval with coarsely granular chromatin and a large nucleolus. The protoplasm is finely granular and takes a uniform pink stain with eosin. In places the protoplasm of adjacent cells seems to fuse, so that a syncytial appearance is produced. There are, however, many cells intermediate in size, and of more or less transitional type. Ovarian tissue is apparently only passively invaded in certain quarters.

Therefore we have before us a tumor growth which diffusely involves the pelvic peritoneum and extends into the abdominal peritoneum in the form of flat patches or plaques, but is always limited to the serous membrane. The point of greatest activity seems to center around the ovaries, at least in this situation the peritoneum is thickest. There is, however, no tumor of these organs which can be interpreted as originating from ovarian tissue, and the microscopic picture also points only to multiple superficial invasions of the cortex by way of fissures. There is, indeed, the possibility that the tumor growth started in one of these fissures, but that no less would make it an endothelioma of the peritoneum.

The possibility of primary growth in other organs has been eliminated as far as possible by careful gross and microscopic examination. The tumor does not correspond to any of the usual types of ovarian growth, particularly those which usually infiltrate or become transplanted to the peritoneum. The absence of mucoid degeneration makes the origin from rectum or colon, or embryonic gut rests extremely unlikely, especially as the whole course of the gut was anatomically intact.

Microscopically this tumor resembles a characteristic endothelioma of the pleura which came to my notice some years ago.

Careful review of the evidence presented above, notably the manner of growth, the cell types, the absence of morphological characteristics which might relate these cells to either gut or other organs and the general anatomical distribution justifies, I think, the diagnosis of a tumor from the peritoneal surface cells. The manner of growth, and the type of cells around and invading the ovary seem to me to point particularly to surface derivation.

Many of the cases described in the literature are characterized by abundant mucous production and Ewing (1) expresses the opinion, also shared by the author, that many of these tumors probably have their origin in a small colloid carcinoma of the colon or in rupture of comparatively benign ovarian cysts. However, such tumors may also arise from embryonic rests within the peritoneum.[1]

E. Kaufmann (2) divides peritoneal endotheliomata into two types: those derived from the endothelium of the lymph spaces and those from the lining or serous layer, and he particularly emphasizes in the latter the flat, patchy (*boesartige*) manner of growth.

Miller and Wynn (3) described in great detail a tumor which they traced to the lining layer of the peritoneum which produced a large amount of mucoid ascitic fluid and showed extensive production of fibrils which, in their opinion, demonstrated its sarcomatous character. They think that the tumors described by Rokitansky (1854) as colloid cancer were probably of the same nature. As regards these and other closely related histoid retroperitoneal types, Kaufmann gives an excellent summary with extensive literature.

It seems well to keep in mind at least the possibility of such primary peritoneal tumors.

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[1]It must not be forgotten, however, that even endotheliomata, especially those of pleural derivation, may exhibit certain secretory qualities (Morrison, Scientific Reports, Royal Victoria Hospital, series B-No. 1.), and that therefore secretory activity is not an absolute criterion in differential diagnosis.

MULTIPLE XANTHOMA OF THE TENDONS[1]

By JOHN E. McWHORTER, M.D., and CARNES WEEKS, M.D., New York

XANTHOMA is a rare disease, especially when it occurs in such forms as to be of surgical significance. We propose to report a case which was treated surgically and to state some of the interesting factors relating to the chemistry and pathology of the disease.

Xanthoma has been considered by the dermatologists as a skin disease, and is divisible clinically into three types: xanthoma multiplex, Xanthoma diabeticorum, and xanthoma palpebrarum. Xanthoma is generally defined as a disease characterized by yellowish lesions of the skin, which lesions are either plain or tuberose in character. It has been shown, however, that the lesions are not necessarily yellow, nor are they always confined to the skin.

The case here presented showed multiple lesions which were tuberose in character and should be properly spoken of as xanthoma tuberosum multiplex. Because of the large size attained by the lesions in this form, it is the one seen by the surgeon and is usually incorrectly diagnosed as either fibroma, chrondroma, or fibrosarcoma. Xanthoma diabeticorum shows plane lesions of the skin and is associated with diabetes. Xanthoma palpebrarum is the type exhibiting plane lesions of the eyelids. All of these forms may be present in the same patient.

REVIEW OF THE LITERATURE

Xanthoma was first described by Rayer (24) in 1836; later by Addison and Gull (1) in 1851. Xanthoma tuberosum multiplex was not described clinically until 1880, when Carry (8), Brachet and Monnard (6) and Besnier and Doyon (5) reported a few cases. Since then much work has been done both from the pathological and etiological standpoint. A recent article by Beeson and Albrecht (4) includes an exhaustive review of the literature.

This disease occurs in children as well as in adults. Of 70 cases collected by Torok (26), 30 cases were under 16 years of age. In certain instances, there seems to be a family tendency. Arning and Lippman (3) report a family in which the mother and 5 of 9 sisters had xanthoma. Schmidt (25) reports 5 cases in the same family. The tumors are situated commonly on the elbows, knees, buttocks, hands and feet, and are often associated with tendons, especially the Achilles tendons and the extensor tendons of the hands. Knowles and Fisher (14) report 10 cases of tendon sheath involvement in children. Some of the skin tumors attain a mushroom or fungus-like growth and have a curious orange-yellow color. They seem to arise from areas where there is much friction, as in the tendons running over joints. There are no subjective symptoms and the one annoying feature is the mechanical interferemce with function, due to their size. Cases are on record in which lesions of the cardiovascular system have been suspected clinically and have been confirmed by autopsy. Lehzen and Krauss (15) report a case of a girl 11 years of age with tuberose lesions of the elbows, knees, buttocks and feet. Some nodular masses were attached to the extensor tendons of the fingers and to the Achilles tendons. She had a mitral murmur and died suddenly. Yellow patches were present on the mitral and aortic valves, which microscopically were xanthoma.

Recently, Weidman and Freeman (27) reported autopsies on 2 xanthoma cases, one of xanthoma tuberosum and one of xanthoma palpebrarum. The first showed typical lesions of xanthoma tuberosum with involvement of the skin and the patellar tendons. The second case was that of a child who had the unusual combination of early jaundice and diabetes insipidus. He was reported clinically by Griffith (12), who, because of the presence of jaundice and polyuria suspected involvement of the liver and pituitary body by xanthoma. There were lesions of the eyelids, of the skin, of various portions of the body, and of the cranium. Pituitary extract controlled the polyuria. The autopsy showed widespread xanthomatous infiltration of the body. There

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Fig. 1 (left). Photograph showing symmetrical distribution of nodules over anterior surfaces of both legs, left elbow, and dorsum of left hand and a large mushroom growth over the right elbow.

Fig. 2. Showing tumors of both tendons of Achilles and nodules on the dorsum of the right hand.

were multiple tumors in the liver, in the lungs, in the pineal gland, in the floor of the fourth ventricle, in the tuber cinereum, in the infundibulum, in the skull, and in the pituitary body; the position of the tuber cinereum being occupied by a distinct tumor mass of xanthomatous tissue. The posterior lobe was infiltrated by xanthoma elements.

Involvement of the bones has been reported by Merrill (18). "X-rays showed many nodular enlargements in the soft tissue; underlying these were abnormalities in the bone, characterized by destruction, which was cystic in nature in the smaller bones. The larger bones showed irregular surface destruction, with partially outlined margins, most noticeable in the phalanges, metatarsals, and the lower ends of the fibulæ and ulnæ." Macleod (16) has also reported lesions of the bones. He found erosions and irregularities of the bones opposite a tumor of the wrist joint. In the autopsy reported by Freeman, in which the bones of the skull were involved,

Fig. 3. Showing the nodules attached to the extensor tendons of the right hand and smaller ones on the left hand.

xanthomatous change was shown by a dense fibrous plaque about 2 centimeters in diameter extending from the pericranium to the dura. Pusey and Johnstone (22) report a case of corneal involvement and one of xanthoma of the larynx, necessitating intubation. From the many situations in which xanthoma has been reported to exist, there can be little doubt that the disease is most probably a systemic one, and while the skin and tendon lesions are striking surface manifestations, all organs and tissues of the body may suffer.

The nature of these curious growths were first considered to be fatty. They were described microscopically to be made up of xanthoma cells, connective tissue and cholesterin crystals. The xanthoma cells were seen to contain sudanophilic droplets. This cell is described as polygonal in contour, with a rarefied and finely granular cytoplasm and a small solid, central, or eccentric nucleus. There may be multinuclear forms containing from one to three nuclei. Giant cells have been observed and are seen to surround the cholesterin crystals, thus suggesting a foreign body reaction. Pollitzer and Wile (21) believe that the xanthoma cells are perivascular connective tissue cells which contain cholesterol. They have seen cholesterol lying free in the perivascular and intercellular lymph spaces and believe that this outpouring from the blood stimulates the formation of these cells. This proliferation in turn acts as a stimulus to the development of connective tissue, which increases and surrounds the nests of xanthoma

cells. Weidman and Freeman (27) believe that the white fibrous tissue cells are the most susceptible and that their hyperplasia is primary rather than secondary to the deposition of cholesterin.

Quinquaud (23) in 1874 was the first to study these tumors from a cholesterol standpoint. In 1910, Chauffard and Laroche (10) determined that there was a relationship between xanthoma and a high blood cholesterol. Since then numerous observers have found a hypercholesterolæmia in all forms of xanthoma. Many methods for the determination of the cholesterol in the blood have been used, but it is believed today that the methods of Bloor, and of Autenreith and Funk are the most reliable. The normal figures run from about 190 to 250 milligrams per 100 cubic centimeters in the former, and from 140 to 180 milligrams per 100 cubic centimeters in the latter, while in xanthoma the figures range anywhere from 250 to 900 milligrams (even 2,500 in some cases) per 100 cubic centimeters. Burns (7) in a recent paper reports a blood cholesterol of 600 to 900 milligrams per 100 cubic centimeters, the latter figure resulting from a high fat diet. Mook and Weiss (19) had three cases, in which the highest figure was 555 and the lowest 270 milligrams. There must, undoubtedly, be some close connection between a hypercholesterolæmia and this disease. Chemical examination of the tumor tissue has shown a high cholesterol content. The highest figure recorded was 1.82 per cent by Beeson and Albrecht.

These constant findings indicate that xanthoma tuberosum multiplex, xanthoma diabeticorum, and xanthoma palpebrarum are identical, both chemically and pathologically. This conclusion was arrived at as early as 1908 by Pinkus and Pick (20). Recently Weidman and Freeman examined plain and tuberose lesions from the same case and found the microscopic pathology identical.

Etiology. The direct cause is undoubtedly the high blood cholesterol, but what in turn is the cause of this pathological change? Chauffard (9) believes that, besides a hypercholesterolæmia of alimentary origin, there are two other types. One type is the result of disturbed liver function, causes retention

Fig. 4. Showing xanthomatous involvement of the Achilles tendons removed from the left ankle.

of cholesterol, and is thus passive; the other type is the result of endocrine secretion and is active. He believes that xanthomata and gall stones belong to the first type, while aortic atheromata and the white patches of albuminuric retinitis correspond to the endocrine variety. Others disagree with this theory and believe that most of the cholesterol is ingested with the food. The endocrine organs may store up cholesterol but cannot produce it. Ingested cholesterol passes into the bowel, reaches the liver, and normally is excreted in the bile. Interference with this liver filter results in damming back the cholesterol in the blood and its deposition in the tissues of the body. It is interesting to note that some forms of xanthoma occur in connection with jaundice and with diabetes, thus pointing to the liver and the pancreas as the possible organs at fault. There is very little known today about the normal metabolism of cholesterol in the body. Mathews (17) in his text book of physiological chemistry claims two functions for cholesterol. It has the important property of protecting the blood corpuscles from hæmolyzing agents, such as the bile salts in preventing anæmia. It neutralizes or checks the

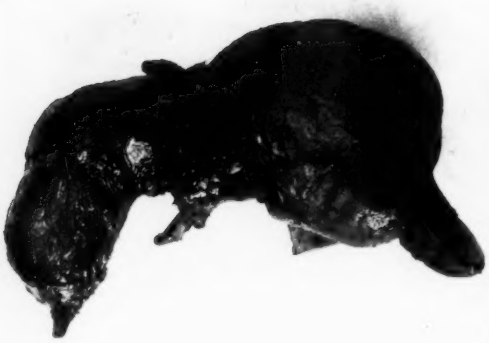

Fig. 5. Showing tumor mass attached to tendons of amputated finger.

Fig. 6. Showing course of the tendon through the tumor of the amputated finger.

action of the lipolytic enzymes and perhaps protects the lipins of the cells from too fast digestion. It is interesting to note that some of the acids formed by the oxidation of cholesterol are poisons, having a toxic action comparable with some of the snake venoms. In this connection, it is possible that some of the decomposition products of this substance, when deposited in the tissues, may cause more than a local foreign-body reaction, resulting in some of the large growths that form in this disease.

As to experimental work, Anitschkow (2) fed rabbits with cholesterol and in addition placed artificial setons, bits of aseptic cork soaked in turpentine, in the skin. Connective tissue macrophages piled up and were converted into xanthoma cells. Chauffard reports a case in which typical xanthomata developed at the sites of hypodermic injection of sodium cacodylate in a patient with a high blood cholesterol.

Harrison and Whitfield (13), in a recent article, state that they believe xanthoma is due to pancreatic disease. They report a case with decreased sugar tolerance in an individual showing no clinical evidence of diabetes. Hypercholesterolæmia, lipæmia, and an excess of unsplit fat were present in the fæces. They believe that these are evidences of abnormality of the internal and external secretions of the pancreas. Their patient had the disease for 12 years and was always in excellent health. They believe that a high blood cholesterol must be present for many years before the tumors develop and that is why there is a comparative infrequence of xanthoma in diabetics with a hypercholesterolæmia. They claim that an increase in the amount of unsplit fat in the fæces indicates disease of the pancreas. One of the known functions of cholesterol is to inhibit the lipolytic action of the lipase of the pancreas; and when cholesterol is increased to a great extent, undoubtedly this action will be limited. The lipæmia is due to the same cause. It is interesting, however, in this connection to report a case of Engmann and Weiss (11) in which the patient came into the hospital in diabetic coma with a blood cholesterol of 1,800 (milligrams), a fat of 4,500 (milligrams), and a papular eruption of xanthoma on the arms, legs, and scalp. After heavy doses of insulin, there was a marked general improvement and by the seventh day the xanthoma lesions had involuted rapidly. In regard to other treatment, surgical removal of the tumors has been tried in many cases, and the few patients who were followed up showed recurrence. Some tried a low fat diet with but little good results.

REPORT OF A CASE

The patient, a colored man, 39 years of age, was admitted to the wards of the First Surgical Division, Bellevue Hospital, on January 21, 1924, complaining of growths over the dorsal surfaces of the right and

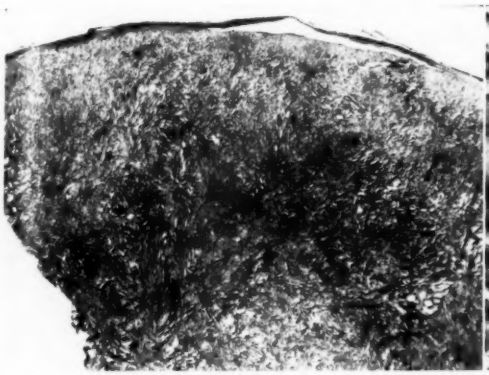

Fig. 7. Photomicrograph showing distribution of cholesterin crystals and thinning of the epidermis.

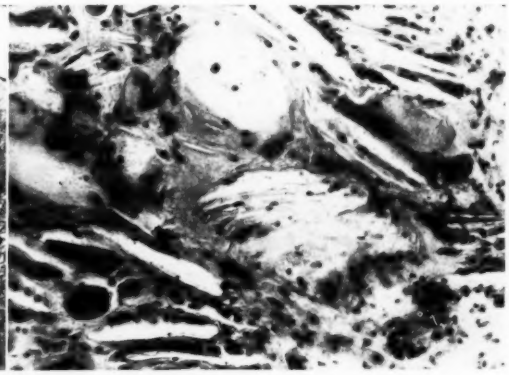

Fig. 8. Photomicrograph showing giant cells surrounding cholesterin crystals.

left hands, the right and left ankles and of both elbows. Eight years ago his right hand was crushed in an accident. Two years later (6 years ago), he noticed a small swelling on the dorsal surface of the right hand at the base of the third metacarpal. It started as a small nodule and increased up to the present size. It caused no pain so he came for no treatment. During the next few years, similar swellings appeared on the right elbow, the dorsal region of the left hand and on both anterior tibial regions, and the posterior portions of both legs near the Achilles tendons. During the last few months, the size of the swelling on the right hand and on the left ankle have made work difficult.

He said that he had never been sick in his life, had lost no weight and had never had any similar growths before. He denied syphilis but admitted gonorrhœa in his youth. He used to drink heavily before prohibition. On being questioned, he admitted having always eaten heavily of fatty foods. In the last few years he has had times of frequent urination, sometimes as often as six or seven times during the day and as many times during the night, but never times of excessive thirst. No members of his family had ever suffered from any similar disease.

Examination. The patient is an extremely well-developed negro, who presents swellings in the following positions: On the dorsal region of the right hand there are 3 tumors, 1 of which is a large lobulated mass arising from the tendon of the right middle finger, while on the left hand are 3 smaller tumors attached to the extensor tendons of the fingers. On the anterior surface of both legs, there are 2 tumors, the upper ones being attached seemingly to the patellar tendon at its insertion to the tibia, while the lower ones are attached to the tendons of the extensor muscles of the feet. Arising from the Achilles tendon of both feet, there are 2 large, lobulated masses, the largest of which is attached to the tendon of the left side. The remaining 2 tumors are situated over the olecranon process, the 1 on the left side arising from the insertion of the triceps muscle, while that on the right side is superficial and apparently springs from the subcutaneous tissue. The distribution of these tumors are well shown in Figures 1, 2, and 3.

These swellings are hard, nodular masses, varying in size from 2 to 15 centimeters in diameter. They are all sharply circumscribed and are freely movable under the skin, excepting the one on the right elbow. They all seem to be firmly attached to the tendons and move freely with them; they are not painful nor tender. By their size they limit normal flexion and extension of the fingers and feet. The mass over the right elbow is a mushroom-like growth; it is attached to the skin only and is the only one of the tumors which presents a real yellow color. The patient is a negro whose skin is of the yellowish-brown color and that is probably the reason why the other tumors do not show some yellow color.

The rest of the physical examination is negative except for a diastolic murmur at the apex.

The first Wassermann test of the blood was three plus; two more were anticomplimentary.

The urine examination was negative seven times with especial reference to sugar.

Chemical examination of the blood showed the following results:

Date 1924	Sugar	Non-protein nitrogen	Uric Acid	Cholesterol	Method
Feb. 15	90mg./100 c.cm.	30	3.5	220	Autenreith and Funk (Normal 140-180 mg. per 100 c.cm.)
Mar. 1	80mg./100 c.cm.	31	3.1	240	
Mar. 15				225	Autenreith and Funk (Normal 140-180 mg. per 100 c.cm.)
Mar. 26				220	
Mar. 15				600	Bloor (Normal 190-250 mg. per 100 c.cm.)
Mar. 26				600	

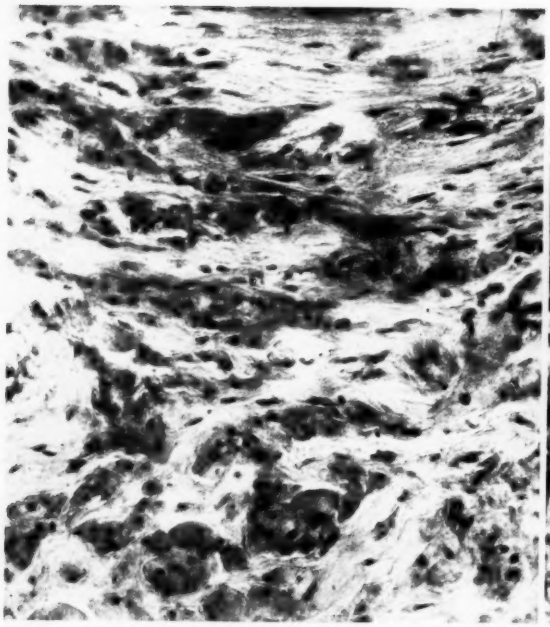

Fig. 9. Photomicrograph showing xanthoma cells arranged in nests and surrounded by dense connective tissue.

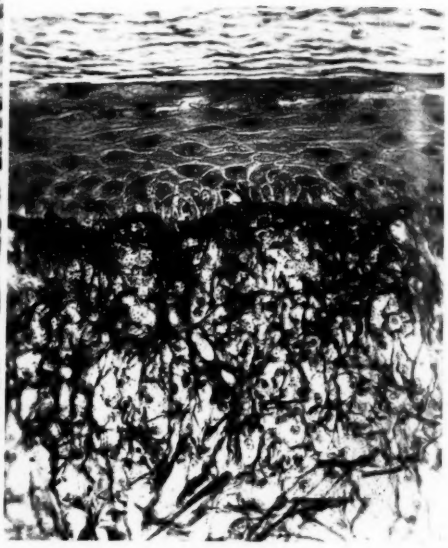

Fig. 11. Photomicrograph showing extension of xanthoma cells to the epidermis.

Chemical examination of two small pieces of tissue removed from the tumor mass of the left hand showed 1.5 grams of cholesterol per 35 grams tissue or 4.2 per cent.

X-ray examinations of the lungs were negative. There was a suggestion of a substernal thyroid associated with a diffuse aortitis. The right clavicle shows irregular but diffuse cortical thickening associated with small areas of absorption, suggesting osteitis fibrosa. The head is characterized by a marked widening of the diploetic layer with evidence of new bone production, suggesting an early stage of Paget's disease. The sella turcica is symmetrically enlarged. Examination of the femora does not show the changes of Paget's disease. Although these findings suggest Paget's disease, may

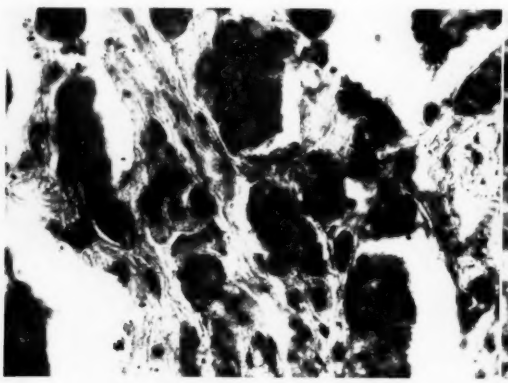

Fig. 10. High-power photomicrograph showing structure of xanthoma cells.

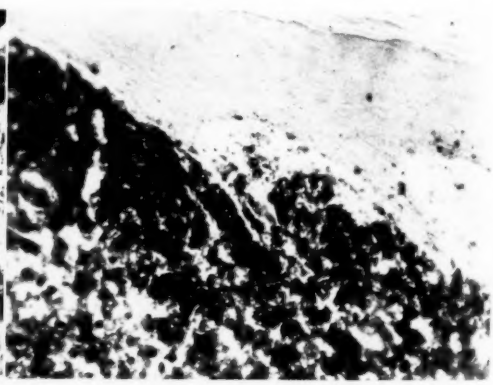

Fig. 12. Photomicrograph of Sudan III stain showing xanthoma cells loaded with sudanophilic droplets.

they not be those of xanthoma? It is obvious that xanthoma tuberosum multiplex has a fairly definite pathology, and it is to a degree selective in that it usually involves the tendons or tendon sheaths. There is, however, sufficient evidence to indicate the probability of bone involvement in certain cases.

Operation. The tumor mass of the right hand was removed by amputation of the right middle finger at the metacarpophalangeal joint. Three distinct tumors were found, which sprung from the extensor tendons of the second, third, and fourth fingers. They varied in size from 1½ by 1 by 1 to 3 by 2 by 1 centimeters.

They were grayish-white in color and firm in consistency. They tended to extend downward between the heads of the metacarpals and were evidently encapsulated and separated from one another. The mushroom growth from the right elbow region was also removed by a small incision. The mass from the region of the left tendo Achillis was removed and a fascia transplant done.

Gross pathology. The specimen removed from the left ankle consisted of a large, circumscribed, encapsulated and lobulated tumor mass, measuring 14 by 3.5 by 7 centimeters (Fig. 4). On section, the mass consists of dense, extremely firm, white tissue. The tendon is seen to pierce the tumor where its structure is almost immediately lost in that of the tumor. The general make-up of the tumor is lobular and through the lower portion of the mass some strands of the tendon are seen running.

The specimen removed from the right hand consisted of 2 circumscribed, encapsulated and lobulated tumors, 1 of which surrounds the first 2 phalanges of the right middle finger (Fig. 5). The former measures 7 by 2.5 centimeters, and the latter 6.5 by 2 centimeters. This is well shown in the photograph of the tumor after removal. On section, the proximal tumor is pierced by the extensor of the finger, which loses its structure in the tumor substance. The photograph of this specimen (Fig. 6) after section shows the entrance of the tendon, its disappearance to a certain extent in the tumor tissue and its re-appearance at the distal end for insertion into the terminal phalanx. The tumor is closely attached to the phalanges at all points of the insertions of the tendon.

The specimen removed from the right elbow region consisted of a mushroom-like growth measuring 5 by 4 centimeters. It was completely covered by skin which was yellow in color and seemed extremely thin. The under surface showed remains of subcutaneous tissue and no evidence of tendon tissue.

Microscopic pathology. The general structure of the tumor is seen in the low-power photomicrograph (Fig. 7), and shows well the distribution of the cholesterin crystals and the extreme thinning of the epidermis. A high-power picture (Fig. 8) shows the clusters of cholesterin crystals surrounded by giant cells containing from 10 to 20 nuclei. Another high-power picture (Fig. 9) shows the xanthoma cells arranged in nests and surrounded by a connective tissue stroma. A very high-power picture (Fig. 10) shows the morphology of the xanthoma cells. They are oval or polygonal in contour, with a granular cytoplasm, and they have a deep-staining nucleus which is usually central but may be eccentric. Some form 2 or 3 nuclei. The photograph of the derma (Fig. 11) shows well the extension of xanthoma cells right up to the epidermis. The derma is almost completely replaced by xanthomatous tissue and the papillary layer has disappeared. The last picture (Fig. 12) of a Sudan III stain, shows the xanthoma cells loaded with sudanophilic droplets and their invasion up to the epidermis. There is no evidence of cellular or nuclear degeneration.

CONCLUSIONS

1. Xanthoma tuberosum multiplex and all forms of xanthoma are the result of a systemic disease, in which hypercholesterolæmia is an essential feature.

2. The pathology of these growths probably represents an irritative connective tissue reaction due to the deposit of cholesterin.

3. Since recurrence of these growths probably follows their removal, surgical interference is indicated only in those cases in which there is loss of function or pressure disturbance.

We wish to thank Dr. Douglas Symmers, director of laboratories, for his advice and help in the preparation of this paper, and also Dr. A. O. Goettler and Miss Silverman for the chemical analyses.

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ACUTE DILATATION OF THE STOMACH AND INTESTINAL TUBE WITH A CONSIDERATION OF "CHRONIC DUODENAL ILEUS"

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ACUTE dilatations of the gastro-intestinal canal are affections of great interest to the surgeon, because they are often encountered in the acute stage. Their etiology and pathology are, to some extent, obscure. The best illustrations have been got from the postmortem room; many have been demonstrated on the operation table, while not a few may be found in the accident ward of a hospital. A less known type is seen among the purely medical cases. It is probable that simple atony of these viscera is a safe or mild degree of this grave condition. I will not venture too far in explanation of these milder types, though, when "chronic duodenal ileus" falls to be considered, it will be necessary to discuss it. Dr. H. Campbell Thomson, London, kindly sent me recently his small but interesting and valuable book, *Acute Dilatation of the Stomach* (1902) for my perusal, and also granted me permission to use his diagrams, two of which appear in this contribution (Figs. 3 and 4).

In the chapter on etiology he roughly divides his cases, 44 in number, into 5 groups. This grouping I propose to follow:

1. Those in which the dilatation occurs without any apparent cause, and in which, after death, no other lesion is found.

2. Those in which, after death, some other definite lesion is found.

3. Those in which the dilatation follows some surgical operation, and in which, after death, no other lesion is found.

4. Those in which dilatation apparently follows some indiscretion in diet.

5. Those in which dilatation follows an injury. With the exception of Group 4, I have had personal experience with the following cases:

One case in Group 1, here given in full detail and of great interest.

Many cases, surgical and medical in Group 2.

Several cases in Group 3.

Two cases in Group 5.

The so-called "chronic" variety affecting the duodenum, will be dealt with at the end of this article.

GROUP 1

This case was sent to me by my colleague, Dr. Walker, Cardenden, Fife. The patient was 19 years of age. Her general physique was poor. I had operated upon her for a severe mixed infection (sepsis and tuberculosis) of the right ankle joint a few months before. The attempt at conservatism failed, and at the second operation I amputated by Syme's method. A general anæsthetic, chloroform, was used on both occasions. Her progress was satisfactory, and she left the hospital apparently well. Following neither of these operations did she show any tendency to postoperative dilatation of the stomach, and during her convalescence her appetite was good. She ate well and without the least discomfort. Immediately after the operations, and throughout her convalescence, she lay quite flat upon her back. The stump healed well. Her home surroundings were unfavorable, her mother

Figs. 1 and 2. *O*, Great omentum (posterior surface); *C*, very contracted colon (transverse colon); *D*, dilated and thin walled duodenum; 1, wooden match in ampulla of Vater; 2, thermometer: bulb in superior mesenteric artery; *P*, firmly tonically contracted pylorus projecting toward duodenum and having the feel of the portio vaginalis of the cervix uteri. Note the caliber of the duodenum beyond the line of crossing of the superior mesenteric vessels.

being feeble-minded. Dr. Walker's history of her present illness, I give in his own words:

"I was called in to see the girl at 6 P.M., her symptoms having developed acutely. She complained of a fullness of the upper abdomen, and of a vague sense of distress and pain. The abdominal muscles showed no rigidity. I did not think that any perforation or acute inflammatory lesion existed in the abdomen, and, therefore, I was not too anxious. I called the following day and found that she had slept fairly well during the night, but now felt uneasy all over the abdomen. A small cupful of clear fluid had been vomited and was shown to me. Her bowels had moved. I again examined the abdomen and found that the distention was much more marked—the contour of a greatly dilated stomach being particularly striking. The liver dulness was normal. There was a slight feeling of resistance over the whole anterior abdominal wall, but it did not amount to definite rigidity. She looked very ill; her pulse was quick and poor in quality. I sent her to the hospital in the evening by ambulance, and was informed that while in the ambulance she had vomited a small quantity of dark fluid. She arrived in hospital at 9:30 p.m., 27½ hours after the onset of the symptoms. I carefully questioned the mother regarding a previous indiscretion in diet to account for the condition, but no such history could be got. There were no premonitory symptoms of any kind to usher in the illness."

The further history was given by the nursing sister. The girl arrived in hospital looking very ill, slightly cyanosed with a feeble pulse and a very much distended abdomen. Very soon after admission to the ward, her bowels moved freely, and almost immediately afterward she vomited several pints of dark fluid, which ran from her nose and mouth almost drowning her as it was ejected. Very soon after this she died. Her illness had ended fatally in a little over 28 hours. I did not see her alive, but almost immediately after death, and made an autopsy at once. Upon opening the greatly distended abdomen, gas escaped freely as from a large visceral perforation. The presenting coils of small intestine were distended. There were no signs of peritonitis. Free fluid in the abdominal cavity was found in the left upper abdomen only, and was of the same nature as that vomited just before death occurred. A large area of stomach wall near the cardia had a dark gangrenous look, and there the wall of the viscus had given way.

This condition was evidently one of postmortem digestion of an area of stomach wall probably much devitalized before death. The stomach as a whole gave the impression of having been much distended, for the escape of gas and fluid in such quantities from its cavity must have considerably diminished the size it had attained before perforation. The pylorus was firmly contracted, beyond which the first and second parts of the duodenum were greatly

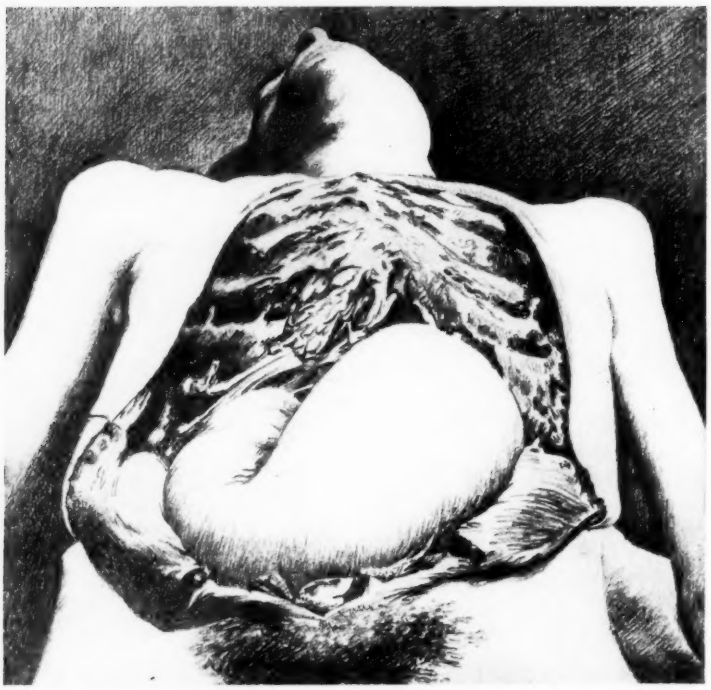

Fig. 3. Acute dilatation of the stomach complicating pleurisy and pneumonia. (Campbell Thomson.)

distended and thin walled. By pressure upon the distended duodenum and toward the pylorus, it was impossible to cause gas or fluid to travel in a backward direction. Following the duodenum farther, the dilatation continued, though in less degree, to the point crossed by the root of the mesentery; beyond this, the gut was more distended than normally, and thence the jejunum and ileum showed distinct distention right up to the ileocæcal sphincter, which was found markedly contracted and impervious to flatus by pressure on the proximal gut. The cæcum was of normal size, and normally placed. The tip of the vermiform appendix was somewhat bulbous and had a few adhesions around it. About 3 inches distal to the ileocæcal valve, the colon suddenly narrowed to become a tightly contracted and evidently empty tube, and continued thus throughout its whole course as far as the pelvic colon. With the exception of the cæcum which was found, as already mentioned, normal in size, the specimen (transverse colon, Figs. 1 and 2) gives a correct idea of the size of the colon throughout. Returning to the mesenteric root I found that digital pressure applied on either side of the point of crossing of the superior mesenteric vessels propelled gas easily in both directions. It was, therefore, evident that no obstruction existed at this point. This was further indicated by the distended condition of the whole jejunum and ileum. A portion of the body of the stomach, the pylorus, the whole duodenum, and part of the jejunum beyond the duodenojejunal flexure, a piece of the pancreas, the superior mesenteric trunks, and a piece of the transverse colon were removed in one mass (Figs. 1 and 2). The important postmortem features were:

1. A dilated stomach showing postmortem digestion and laceration.
2. A very much dilated and thin walled duodenum.
3. A dilated small intestine throughout.
4. A powerfully contracted pylorus.
5. A contracted ileocæcal sphincter.
6. A sphincteric-like contraction distal to the cæcum.
7. A marked contraction of the whole colon.
8. A normal cæcum.

To recapitulate, the important features during life would appear to be:

1. The rapid onset of the disease, and its rapidly fatal termination.

2. The almost complete absence of vomiting until just before death, when it was severe.

3. No apparent exciting cause.

4. No previous digestive disturbance.

5. No evidence of previous postoperative disturbances of the stomach, etc., following previous surgical operations where a general anæsthetic was employed.

It may now be advantageous to discuss the pathology of such a case. Three theories, and theoretical all three conceptions undoubtedly are, are advanced to explain such conditions:

a. An upset of the nervous mechanism of the stomach and intestine causing a paralytic ileus.

b. An altered secretory activity of the mucous membrane of the viscera involved. ("Gastrorrhœa" when the stomach only is acutely distended.)

c. A mechanical ileus, the point of constriction being that where the superior mesenteric vessels cross the duodenum.

It will be patent to anyone that (c) is quite out of the question here; (b) as a primary cause is negligible; (a) is the only theory which will explain the pathological findings to a satisfactory degree. Attention must, therefore, be focused upon the various tonically contracted "sphincter areas" and the several lengths of the acutely dilated and evidently paralyzed gastro-intestinal tube.

The nervous mechanism of the stomach and gut upon which experimental physiology has given us considerable information, is a very intricate one. We know that there is a healthy balance maintained between the vagal and the sympathetic innervation. Stimulation of the sympathetic would produce every feature of the condition of the alimentary canal found in this reported case, except the tonically contracted colon. Depressed function of the vagi, of course, would act in a similar manner. The "nervous upset" theory may, therefore, be either (a) the sympathetic responding to abnormal stimulation, the vagal action meantime remaining normal, or (b) the sympathetic action appearing more pronounced owing to a depressed activity or inhibition of the vagal influence. It is not easy to say which type of disturbed balance

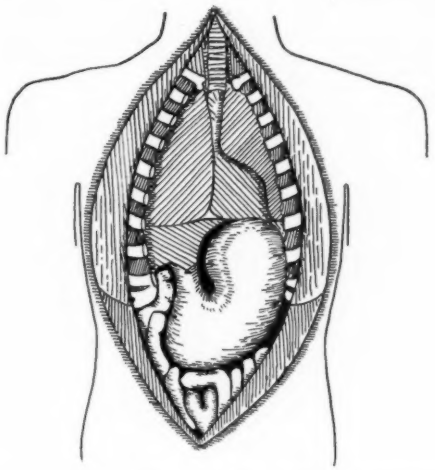

Fig. 4. Acute dilatation of the stomach complicating fracture of the skull and cervical spine. (Campbell Thomson.)

exists, or even that the one persists and predominates throughout the course of the disease. The copious vomiting and the free evacuation of the bowels toward the termination of this patient's illness, would seem to indicate a distinct though temporary parasympathetic response. The absence of vomiting in the earlier stages would point to depression at some part of the reflex vagal arc.

Why the colon should have remained so tonically contracted after the bowels had moved is not easily explained. Many cases have been investigated in which the stomach alone suffered acute dilatation; in others, the stomach and first part only of the duodenum; in others (and these, unfortunately, have been made the most prominent in the literature), the dilatation of the duodenum ended at the point of crossing of the mesenteric vessels; in a few, the dilatation affecting the stomach and duodenum extended several inches down the jejunum; and lastly, as in my own case, the dilatation may extend throughout the whole small intestine, ending at the ileocæcal sphincter. It is easy, if the "nervous upset" theory is accepted, to explain why the most dilated viscera should be the stomach and duodenum in whole or in part, for these are admittedly the parts of the gastro-intestinal

tract possessing the most exalted function, and would accordingly suffer to a much greater degree than the parts lower down. I will not venture to discuss the "altered secretion" (gastrorrhœa) theory, except to agree in the observations of others, that the amount of fluid vomited in most cases of acute dilatation of the stomach is very large and difficult to explain, unless on the supposition that there is a greatly increased secretory activity of the mucosa; such a state of affairs would necessarily depend upon a nervous upset.

It is, however, certainly interesting to find that primary acute dilatation of the stomach has been demonstrated at operation in some cases, and in others in the postmortem room, in which practically the whole distention of the organ was gaseous, no excess of fluid being present in the viscus. By some authorities these have been considered examples of the early stage of the disease. The "superior mesenteric artery pressure" theory is easily disposed of. It is fanciful and really untenable. Many cases given by Dr. H. Campbell Thomson and my own case, go far to disprove this mechanical theory. It is reasonable to admit that the condition of acute dilatation once fully developed might be aggravated by the tension of the superior mesenteric arterial trunk and mesenteric root, but as a distinct causative factor the artery surely plays no part. The cause of the vagal inhibition is obscure; very probably it is the result of the action of a toxin or foreign protein.

Turning to the purely medical type of case exhibiting disturbance of the vagosympathetic balance we find that the thoracic viscera show the "nervous upset" theory at its best. Spasmodic asthma, associated as it usually is with vagotonia, is easily and quickly relieved by inducing a sympatheticotonia by the subcutaneous administration of adrenalin. Thus the balance is regained, and the paroxysm comes to an end. That certain proteins can cause asthma, nobody now doubts. The subjects of asthma are frequently neurotic in type, and I have been struck by the number of patients with atonic stomach who have exhibited the same nervous instability. A most instructive case came under observation recently: A girl suffered from diphtheria (pharyngeal and laryngeal) and required tracheotomy. The operation gave immediate relief. Twelve hours later, the nurse in attendance after giving the child a small quantity of water to drink, was much startled to witness a severe dyspnœic attack. She at once concluded that the inner cannula of the tracheotomy tube was blocked, but was surprised upon withdrawing it to find that it was quite clear. The child struggled for breath, became cyanosed, and looked as if about to die, became exhausted and was bathed in profuse perspiration. Then followed a period of quiet breathing with disappearance of the cyanosis, and recovery from the paroxysm. Soon afterward I saw the girl, and as she made a sign for a drink, the nurse gave her a teaspoonful of water; a few seconds later I saw a repetition of the alarming attack already described. She recovered in the same fashion. For a third time, and after a mixture of water and alcohol had been given, a severe attack of dyspnœa, etc., began and ended as before. The case ended fatally 6 hours later. There could be little doubt about the cause of these attacks. The ingestion of the liquid stimulated the afferent fibers of the vagus and produced reflexly a severe paroxysm of bronchial spasm almost amounting to fatal asphyxia. In the recovery from such attacks, it is difficult to say whether the conductivity of the reflex arc became exhausted by the anoxæmia, or whether there was a sudden discharge of adrenalin into the blood stream. That it was a disturbance of the vagosympathetic balance is almost certain, and that the disturbance was primarily due to stimulation to the afferent vagal fibers from the stomach, is equally certain.

GROUP 2

Group 2 constitutes those cases in which, after death, some other definite lesion has been found.

In this group may be mentioned those cases which occur complicating other acute medical and surgical diseases such as pneumonia (Fig. 3) and septic peritonitis. The latter condition is very frequently, almost invariably, accompanied by a paresis of the whole intestinal canal and stomach, and in certain late phases

of the disease, the clinical picture resembles, in many features, that of acute dilatation of the stomach and bowels. We have yet to learn why in septic peritonitis the paresis of the gut occurs. No satisfactory explanation has so far been given; it is probably due to a fault in the nervous mechanism of the bowel induced by the action of the toxin. The stomach and small intestine suffer most, as autopsy frequently shows. The dilatation of the stomach, and the frequently pronounced gastric symptoms in certain pneumonias terminating fatally, would certainly support the "nervous upset" theory as against any other explanation. I have noted, chiefly of late, the meteorism found in cases of fatal pneumonia, and this to a less extent in serious but non-fatal attacks. One of my colleagues informs me that he has for many years noted this among the large number of cases of pneumonia he has treated. In his experience it is "of common occurrence." A common accompaniment of a pneumonia is herpes facialis, which is probably associated with definite changes in the gasserian ganglion. This may mean that the pneumococcal toxin has a definite selective action upon such groups of nerve cells as are found in a root ganglion. It is not too imaginative to think that this toxin would affect the groups of nerve cells in the ganglia of the sympathetic system, or in the medulla constituting the vagus nucleus. Twenty-five years ago Dr. Byrom Bramwell, Edinburgh, taught his students that bilious vomiting in a case of pneumonia was a grave omen. He gave no reason for this. In the light of more recent investigation it might be argued that severe and repeated vomiting accompanying fatal pneumonia is due to acute dilatation of the stomach and gut, the result of disturbance of the nervous mechanism caused by this well known active toxin. I have also heard recently that Professor Meakins, Edinburgh, draws attention to meteorism accompanying pneumonia, and considers it a grave condition.

GROUP 3

Those of us who have passed many surgical cases through our hands,can vividly remember cases of acute postoperative dilatation of the stomach. In practically every case a general anæsthetic has been employed. Nobody will deny that general anæsthesia acts deleteriously, for some time at least, upon the whole nervous system, nor can it be doubted that the stream of nociceptive impulses from the field of the operation acts similarly. It is quite untrue to state that postoperative dilatation is found chiefly in cases in which large abdominal tumors, such as ovarian cystomata, have been removed. Gall-bladder operations are probably the most pernicious in causing this unfortunate sequel; but whether this be so or not, it is almost absurd to believe that the intestines suddenly released into the lower abdominal and pelvic cavities, cause a drag upon the mesenteric root, constrict the duodenum, and thus cause an "acute duodenal ileus." Many autopsies have shown that the duodenum either has not participated in the dilatation at all, or only in its first part. Others show the dilatation passing well beyond the mesenteric root.

Just because it is found that in a certain number of cases the dilated gut ends where the mesenteric vessels cross, mechanical obstruction is not by any means proved. Moreover, in the treatment of the large majority of these unfortunate sequelæ to operations under general anæsthesia, stomach lavage is the main object; many recover speedily by prompt gastric lavage, even though, for other reasons, the patient may be compelled to rest in bed in the semi-sitting posture. Some surgeons have noted in performing cæsarian section, at term, that, when the operation is nearing its close, the greater curvature of the stomach becomes prominent in the upper part of the wound, and the viscus itself gradually distends with gas as if being slowly inflated by an air pump. Surely here the "mesenteric drag" cannot have developed, especially when one considers that the patients are lying on a plane slightly inclined downward toward the head.

A recent good demonstration of this was given by B. P. Watson, professor of midwifery, Edinburgh University. He stated to his students that in such cases he made it a matter of routine to pass a stomach tube and allow the gas to escape from the stomach before returning the patient to bed. This he

proceeded to do, and the distention of the organ visibly disappeared following the rush of gas through the funnel of the stomach tube. I have been struck over and over again by the abdominal distention, unaccompanied by vomiting, in cases in which postoperative sepsis did not exist, which follows a fair percentage of cæsarean sections. This is quite uncommon after normal labor.

Mayo Robson (Keen's *Surgery*) in discussing the treatment of acute postoperative dilatation of the stomach says: "Lavage of the stomach repeated as often as necessary should be carried out as soon as the condition is recognized, and if the hypersecretion tends to continue, I should have no hesitation in advising gastrojejunostomy, a method I first suggested in 1900." When he wrote this he may not have heard of the possibilities of duodenoduodenostomy across the mesenteric root. In my opinion, his operation of gastrojejunostomy is still the correct operation, though, fortunately, seldom required in this catastrophe.

GROUP 5

Group 5 constitutes those cases in which dilatation followed an injury. It is fortunate that I can borrow from Dr. H. Campbell Thomson Figure 4 which shows the condition found in a case of fracture of the skull and cervical spine, fracture and dislocation of the fourth and fifth cervical vertebræ, and fracture of the spinous process of the fifth dorsal vertebra.

In 2 cases of fracture of the cervical spine at the level of the fifth cervical vertebra, I noted along with the usual skeletal muscle paralyses, a progressive distention of the abdomen. Both cases terminated fatally in a few days. By some, this abdominal distention has been attributed to the distention of the stomach and gut with gas, and to the loss of support of the abdominal muscles which have now become paralyzed. I am inclined to believe, on the other hand, that the œdema of the cord spreading upward from the level of the compression invades the vagus nucleus in the medulla, and that again we are dealing with a disturbance of the nerve mechanism of the stomach and bowels. We have all seen the old multipara enjoying good health, yet possessing only a thin, almost transparent, anterior abdominal wall, whose recti are feeble and widely separated. The abdomen is flat and often scaphoid, peristalsis of the gut is easily visible, yet there is no tympanites; the hollow viscera are not dilated, though support from the abdominal wall hardly exists.

CHRONIC DUODENAL ILEUS

This condition as a clinical entity has been brought rather prominently before the profession of late. It is attributed to the constricting pressure of the superior mesenteric vessels as they cross the duodenal wall. It is indicated by a series of symptoms, viz., obstinate dyspepsia with fullness after eating, frequent attacks of bilious vomiting, migraine, constipation, loss of weight, and general abdominal discomfort. It is said to be a prominent feature of general visceroptosis.

The operations proposed for it vary from a fixation of a mobile cæcum—thus to remove the abnormal traction of the ileocolic branch of the superior mesenteric artery upon the main trunk crossing the duodenum—to an anastomosis of the gut across the main trunk of the vessel or mesenteric root, duodenoduodenostomy. That any normal arterial trunk should be capable of producing obstruction of the gut, is, to say the least of it, extraordinary. If this be a genuine mechanical ileus, it follows that an anastomosis should absolutely cure it, and that patients so afflicted will, after operation, suffer no more. It also follows that nothing short of an anastomosis will relieve typical cases.

I have had brought before me recently, two cases diagnosed as typical and treated by the anastomotic operation. Both are miserable surgical failures; one states that she is much worse than she was before operation, and the second requires lavage of the stomach every day or two, a method of treatment not required until after the anastomotic operation had been performed. The former of these was, I believe, quoted in a series given by her surgeon as cured. Neither of these cases was complicated by cholecystitis, cholelithiasis, duodenal ulcer, thickened mesenteric root, etc., or by any of the host of conditions that have been found present when duodenoduo-

denostomy is about to be performed. I do not deny, that, for a few weeks following the operation, improvement is noted, but surgeons frequently obtain similar results after simple resection of a normal vermiform appendix. It is just then that we see a surgical hunt for an excuse for the operation; if any velamentous or denser structure can be seen, it is pronounced pericolitis (Jackson's veil) and is promptly removed, the object being to mobilize the cæcum and ascending colon. If no such structure is found the surgeon may conclude that the cæcum is too mobile and likely, when full, to cause a drag. He may, therefore, plicate it and fix it securely by a series of sutures to the parietes. He may even convince himself that by such procedures he has gone some distance in the treatment of migraine associated with chronic duodenal ileus.

To attribute the primary benefit to an anastomosis, to a fixation of the cæcum, to a nephropexy, or to any form of surgical tailoring in these cases, is to forget the benefits derived from the rest in bed, the regular and careful feeding and nursing, and the period of holiday following the convalescence.

We are often tempted to remove a "chronic appendix" from those vague dyspeptics; the appendix we do remove is only too often wonderfully free from disease, yet we find the patient relieved of the pain she was wont to feel in the right iliac fossa; we see her eat a hearty meal without discomfort, and we see her gain in weight, and remain well for a varying, often lengthy, period of time. We cannot believe that we have obtained such a result by removal of disease. The operation of duodenoduodenostomy is almost as harmless as that of resection of a normal appendix, and it is almost as unjustifiable. End-results only are of value, and the results of operations upon neurotic women are very difficult to analyze. He is, indeed, a wise surgeon who considers some results surprises, and he is still wiser who refuses to repeat an operation until he can thoroughly satisfy himself that the benefit derived is the result of the operation performed.

As time passes, I feel pretty confident that the "superior mesenteric artery pressure" theory will fade until it disappears altogether from our horizon. Sir James Mackenzie's ideal is the close co-operation of the physiologist, the clinician, and the pathologist in the investigation of all obscure conditions. In lesions of the gastro-intestinal tract, such co-operation, I am sure, will be of immense value, and will save the surgeon from a fault far more serious than poor dexterity, viz., incorrect diagnosis.

SEMINAL VESICULITIS AS A COMPLICATION OF PROSTATISM AND PROSTATECTOMY[1]

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THIS brief paper is based on only a few ideas and even fewer established facts, but it is presented in the hope that it may stimulate further interest and investigation which I am reasonably sure will be productive.

When one considers the relation of the ejaculatory ducts to the prostatic urethra, the disturbed mechanism of urination which continues throughout the course of the disease in cases of prostatism, beginning with the earliest symptoms; and when one considers too that in a large majority of these cases the urine is grossly infected and that at the operation of prostatectomy the ducts are frequently traumatized, sometimes even cut or torn across; it would seem that conditions are favorable for infection of the seminal vesicles directly along the caliber of the ejaculatory duct or through its own or adjacent lymphatics. I believe that it is reasonable to assume that infection of these structures may occur, and in my opinion it does occur with a fair degree of frequency. Yet up to the present time this subject appears to have attracted very little attention from the profession. A careful survey of the literature was entirely barren with the exception of a paper by Boyd (1) of Georgia, published in the *Journal of Urology*, in which he reports a case of seminal vesiculitis following prostatectomy, the micrococcus catarrhalis being the infecting organism, and an excellent paper by the same author published in Surgery, Gynecology, and Obstetrics for March, 1924 (2). This article came to my attention when my own paper was about completed, so that evidently we had been working independently along the same line. Nevertheless I feel that Doctor Boyd is entitled to all the credit for bringing this important matter to the attention of the profession. In his paper he points out the close relationship between epididymitis and vesiculitis, maintaining that epididymitis always means also a vesiculitis on the corresponding side. He feels that an acute vesiculitis occurring shortly after a prostatectomy accounts for certain local and systemic disturbances which have hitherto been attributed to other causes. He maintains that the cause of this complication lies in trauma inflicted upon the vesicles and ampulla at the time of operation, plus inadequate drainage of the prostate bed. He makes practical application of this concept of the etiology and tries to prevent the condition by employing gentle manipulation on enucleating the prostate and by carefully providing for drainage of the prostatic bed as a part of his operation.

I agree with him that epididymitis practically always means an associated vesiculitis. I feel, however, that vesiculitis occasionally occurs independently of any involvement of the epididymis. My own paper concerns itself more particularly with clinical phases noted in the later stages following prostatectomy and cases of vesiculitis complicating prostatism which have not been subjected to operation.

My attention was first called to this matter 2 years ago by a few cases occurring in my clinic. The patients, following prostatectomy reported at the out-patient department for observation and such treatment as might be indicated. In some ways these cases might be classed as good results They looked better and felt better, the urine was less cloudy, and the amount of residual was reduced to a very small quantity or nothing at all. And yet one symptom, frequency of urination, persisted almost if not quite as severely as before operation. Many times this was the symptom which had brought the patient to the clinic, so that if we were satisfied with a successful operation, the patient was not satisfied with the result obtained. We attributed this state of affairs to the complicating cystitis and accordingly put them on bladder irrigations, using various solutions, internal urinary antiseptics, santal oil, etc., with very little if any

[1] Read before the American Association of Genito-urinary Surgeons May 26, 1924.

improvement. A few of these patients volunteered the information not in the nature of a complaint but rather as a statement of fact, perhaps as an accomplishment, that they were having frequent erections, which they had not had for years before. Upon inquiry into this symptom it was developed that the erections were not accompanied by any sexual desire, and were sometimes actually painful. Even with this suggestive symptom to guide us we still failed to grasp its significance, and persisted in our bladder lavage with scant results. It was not until several months later that it occurred to us that the seminal vesicles might be at fault and that a careful rectal examination was indicated. Right here I should like to interpolate that in my opinion this item is often neglected in the aftercare and treatment of patients who have been subjected to prostatectomy. I am sure that I had neglected it before my attention was drawn to the subject under consideration. Since that time I have made it a part of a routine procedure, and consider it very important.

In all the cases referred to above, rectal palpation disclosed unmistakable evidences of vesiculitis and perivesiculitis. In some instances the vesicle could be distinctly felt, thickened, hard, and somewhat tender. In other cases a plastic exudate was noted about one or both vesicles, extending higher than the finger could reach. All of these cases were improved by massage, some of them so promptly as to be striking. In 50 per cent of these cases it was impossible to obtain any material for smears and cultures. I assume that in these cases the contents of the vesicles were squeezed directly into the bladder. In those cases in which we were able to obtain smears we invariably found pus, varying from a few clumps to smears which had the appearance in gross and under the microscope of pure pus. For some reason or other, faulty technique perhaps, our cultures were unsatisfactory, either being sterile or presenting evidence of contamination. This item I believe is well worthy of further investigation.

The symptoms which have focused our attention in all of these cases have been the marked frequency of urination both diurnal and nocturnal, persisting after operation, and tendency to mild priapism. Having satisfied ourselves that this condition occasionally occurs as a complication of the prostatic problem and that in some of our cases it no doubt existed before operation, we made it a point to keep it in mind when examining cases which were referred as possible candidates for prostatectomy, and found as noted below a few cases which seemed to fit in with our conception of such a combination of pathology. We were led to suspect such a state of affairs in all cases when the urinary frequency was out of all proportion to the degree of mechanical obstruction as evidenced by the amount of residual urine. We felt fairly well confirmed in our suspicion if there was added to this a tendency to priapism.

This paper is based upon a series of 10 cases studied following a prostatectomy, and 4 cases observed in which no operation has been done. Of the 10 cases operated upon, in one which will be reported in detail at the end of this paper, I am sure the condition existed before operation. In fact I doubt if the operation (prostatectomy) was well advised. In two others a careful review of their histories leads me to believe that vesiculitis was a prominent factor in producing the symptoms before operation. In the remaining 7 it would appear that the condition occurred as a complication of the prostatectomy rather than the prostatism. In 3 of these cases there was a history of a rather severe epididymitis complicating convalescence while the patients were still in the hospital. One of these occurred in a patient who we assume had the vesiculitis before operation. The other two were in patients in whom we believe the vesiculitis followed the prostatectomy. In still two other cases small hard nodules were noted in the epididymis which had not been noted in the previous record, nor was there any record of an acute epididymitis while the patient was in the hospital. It is quite possible, rather likely, I think, that this may have occurred and passed without note. It would seem reasonable to assume that epididymitis would occur rather commonly in connection with vesiculitis, but we have

not yet studied a sufficient number of cases to establish the connection.

In all the cases studied the urine was grossly infected before operation. In 5 of these colon bacilli were found on culture, in the remaining 5 there was no note of the organism. In 3 cases the urine promptly cleared as soon as treatment was directed to the vesicles; in 2 others it became clear after a rather prolonged course of massage and bladder lavage; in the remaining 5, while the subjective symptoms were markedly improved the urine remained cloudy when last observed.

The four cases not operated upon were all seen in private practice and were all referred to us for prostatectomy. They all had slightly turbid urine, they all had some prostatic enlargement, and they all had residual urine ranging from 1½ to 3 ounces. In 3 of these cases one could note in addition to a slight enlargement of the prostate, definite evidences of a vesiculitis on one or both sides. In the other case the first impression that one got with the examining finger was that of a prostate rather markedly enlarged. More careful examination revealed what I interpreted as a pair of large flabby vesicles prolapsed over a boggy prostate. One of these patients was entirely relieved of all symptoms, including his residual urine, after 3 months of massage. He now reports at occasional intervals for a check-up, so that we know that so far his relief has been lasting. One patient passed from observation shortly after beginning treatment, one was much improved when last seen, and one is still under treatment, and is improving.

It is my custom to treat these cases twice a week as follows: The patient first voids; the urethra is then irrigated with a 1:4000 acriflavine solution; the bladder is then filled through a small catheter with the same solution; the vesicles are now massaged and the patient voids again. I believe that attention to each detail is important.

The following case is reported in some detail since it illustrates perhaps better than a long paper would do, the points which I have attempted to make.

J. H. O., age 63, married, applied for treatment April 21, 1921. The family and general history were irrelevant. He denies any venereal history. He has been married 28 years and has had a reasonably normal sex life. For the past 8 years he has been troubled with frequency and urgency which have been gradually becoming worse, until now he urinates every one and a half to two hours by day and four or five times at night. For the past year he has had frequent erections not accompanied by any sex desire. He has had an erection each time he is awakened at night to urinate; the erections are not painful but annoying.

Examination. He has the appearance of being in good general health. General physical examination is negative. The external genitals were normal. The urine is passed in rather a slow feeble stream. Residual urine, 2 ounces; rather hazy; contains a moderate number of pus cells and culture shows bacillus coli. Rectal examination: There is a moderately well marked, general, regular, prostatic enlargement. No note was made in reference to the vesicles. Cystoscopy: The deep urethra is very sensitive; there is a well marked congestion of the trigone and deep urethra and moderate enlargement of both lateral lobes of the prostate. Operation was advised. He was admitted to the Brooklyn Hospital on June 3, 1921. June 4, phenolsulphonephthalein was returned in first hour, 15 per cent; in second hour, 15 per cent; in third hour, 5 per cent. Wassermann was negative. Blood chemistry showed uric acid, 4.2; creatinin, 2.17; sugar, 109; carbon dioxide combining power, 62.4; chlorides, 490.

June 7. Cystoscopic examination was done under local anæsthesia. It was noted at this time that there was no thickening of the bladder wall. This is an important item to which sufficient regard was not attached at the time. A marked degree of mechanical obstruction extending over a period of 8 years would certainly have induced some degree of hypertrophy in the bladder musculature. The moderate enlargement of the prostate noted at previous cystoscopy was confirmed.

June 19, phenolsulphonephthalein was returned in first hour, 30 per cent; in second hour, 15 per cent; and in third hour, 10 per cent.

June 20, suprapubic prostatectomy under nitrous-oxide anæsthesia. The gland was enucleated in two pieces with some difficulty. The pathological report was as follows: "The stroma is open and œdematous and contains numerous areas of lymphocytic infiltration. The alveoli are, for the most part, dilated. The epithelium is flattened and numerous large corpora amylacea are present. A few of the alveoli contain polymorphonuclear leucocytes." Obviously there is a predominating element of inflammatory reaction.

Except for an abdominal wall infection from which bacilli coli were recovered his convalescence was uneventful, and he was discharged from the hospital on July 8. At this time he was voiding rather cloudy urine at rather frequent intervals. He went to the country and was not seen again until November, 1921, at which time he reported that he was urinat-

ing every 2 hours by day and getting up three or four times at night. His troublesome erections were just as bad as ever. The urine was variable; it was occasionally crystal clear, at other times it was cloudy and contained abundant pus cells. The appearance of the urine seemed to have no bearing on the subjective symptoms.

He was not seen again until April, 1922, and from then to the end of the year had occasional bladder washings at infrequent intervals, with no improvement.

After several months' absence he reported in April, 1923. His condition had remained about the same until the last 4 weeks, during which time he had been worse. In fact his symptoms were more aggravated than they were before operation. Rectal examination at this time disclosed a well marked exudate around both vesicles, somewhat tender and extending as high as the finger could reach. Gentle massage on this area expressed what appeared in gross and under the microscope as pure pus. Cultures were sterile. A few days later he developed a very sharp right epididymitis. Massage was resumed on May 1, and continued at 3 or 4 day intervals over a period of 3 months, with rapid and marked improvement in all symptoms.

July 9, 1923. Patient feels much better. He gets up once at night. The urine is clear.

September 13. Patient is entirely free from all symptoms. Urine and vesicular smears are free from pus.

While this man had a moderate prostatic enlargement it was not grossly obstructive, and his symptoms were doubtless due almost entirely to the complicating vesiculitis. If this fact had been properly appreciated he could have been restored to health by simple conservative measures, and have been spared an operation which to say the least, was of doubtful value.

CONCLUSIONS

In conclusion I realize that this paper has been very sketchy, that the amount of material studied is hardly enough to warrant drawing any definite conclusions, that the degree of intensiveness with which these cases have been studied and the brief method in which they are now presented, are not especially convincing. However, the subject is presented as I said at the outset, for your consideration and discussion in the hope that it may stimulate further investigation and study. I am confident that this complication occasionally occurs, that it is the cause of very annoying symptoms which persist if the real pathology is overlooked, and are readily and promptly relieved by very simple measures when properly understood. I believe, too, that a proper appreciation of this lesion as a possible factor in the problem of prostatism may save an occasional case from the danger and discomfort of a major operation.

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INTRAVENOUS INJECTIONS IN SEPTIC CONDITIONS

By CARRICK ROBERTSON, F.R.C.S., Auckland, New Zealand

THE subject of my remarks is "Intravenous Injections for Septic Conditions." You will note that I have used the term "septic conditions" advisedly because it is part of the proposition which I am putting forward that the usefulness of intravenous injection is not to be determined by, or restricted to, those cases in which the bacteriologist can demonstrate microbes in the blood or what might be called academic septicæmia, and further my purpose is to suggest to this audience that, although enthusiasm should not outrun knowledge, a much wider employment of intravenous injection is justified by the experience now at our command.

At this stage I may be permitted to make a brief historical summary of the practise of injection. Beyond a few allusions in classical literature, upon which no great reliance can be placed, the subject appears first in medical literature shortly after Harvey's discovery of the circulation of the blood, in the 17th century. There is on record a suggested experiment of injecting a pigment into a living vein which was made by Sir Christopher Wren. (Wren is known to fame chiefly as a great architect, but in fact he was a man of varied scientific employment and even the great physicist Newton bears tribute to his ability in this respect.) Following upon Harvey's discovery, researches along these lines were carried out in England, France, and Italy, but the literature on the subject is meager and ends suddenly. I would like, by way of digression, to call your attention to a remarkable case which occurred in Paris in the year 1767 or thereabouts, namely, a case of intravenous injection for insanity. It is recorded that the injection was made by a Monsieur Denis. The patient was a man of 45. Apparently a cure was effected, for the man's mental condition is said to have remained normal for the space of a year. Toward the end of this period he had a relapse and his wife pleaded for a second injection. At the moment when the second injection was about to be given, the patient was seized with "such a violent trembling in all his limbs" that the transfusion was not given. The patient died during the following night. The wife who had pleaded for the second injection, now sued the doctor and a mild censure was passed upon him by the court. The court does not seem to have been convinced that the injection was a good or safe treatment, for although it was not interdicted, the court held that such treatment should not be undertaken except with the approbation of the Faculty of Paris.

For nearly two centuries after this, few references can be found in medical literature to any such treatment by injection, and no doubt before the era of asepsis, these operations must have been very dangerous. We, therefore, have to jump a period of two centuries and come to about 15 years ago, when began the intravenous injection of "606" or salvarsan. During the period which has intervened since then, millions of injections must have been given with success, and no further evidence is needed that the injection of strong drugs into veins is under due precaution, safe and simple.

From time to time during recent years papers have appeared in both American and English medical journals giving wonderful results from treatment of septicæmia by intravenous injections, to which surgeons, physicians, and obstetricians have contributed. Various drugs have been used for these injections, for example, iodine, mercurochrome, gentian violet, eusol, salvarsan, quinine, and all these have given good results in certain cases.

My attention to the value of intravenous injections in septicæmia was aroused by reading an article by Professor Lorraine Smith in the *British Medical Journal* in the early years of the war, in which he advocated the use of eusol. Shortly after reading this article it happened that I had, as a patient, a nurse who had developed septicæmia from a

boil. There is no reason for enlarging upon details of the case except to say that it was a case of definite septicæmia and eusol was injected with complete success. In my own opinion, and in the opinion of others who had the case under observation, the life of the patient was saved by the intravenous injection of eusol.

From this time on, it has been my practice in the treatment of severe septic states to use intravenous injections of freshly prepared eusol of an average dose of 50 cubic centimeters. Eusol is akin to Dakin's solution. I now proceed to describe more in detail two of the many cases which have come under my immediate notice, in which remarkable improvement has been effected by the use of this injection.

The first of these two cases was a woman aged 40, who, when I saw her, had a pelvic peritonitis with pus formation arising after an operation for ventrosuspension. The pus was spreading up the colic gutters; the temperature high and there were occasional rigors. An operation for abdominal drainage was successfully performed, with good immediate results. A few days later a steep rise occurred in the patient's temperature, and a small abscess became palpable to the left of the central abdominal incision.

The patient was now very ill. The abscess was opened under gas anæsthesia, but no improvement followed, and a bad rigor occurred an hour or two after the operation. By the next morning the patient was much worse, her pulse uncountable, appearance cyanotic; she was only semiconscious, was picking at the bed clothes, and seemed about to die. No fresh collections of pus could be palpated, and although it seemed quite hopeless, at the urgent request of her doctor, eusol was given intravenously, with the happy result that 6 hours later the patient was expressing herself as "feeling quite different"; and though her temperature did not come to normal for 4 days, she made an uninterrupted recovery, without any further pus formation. Only one injection was given. The symptoms in this case probably point to a diagnosis of septicæmia, but no actual blood cultures were made, so it was not a case of scientifically demonstrated septicæmia.

The second case to be referred to is that of a man aged 44, who had pylorectomy for a large ulcer near the pylorus. Surgically he did very well, in so much that at the end of a week he was hungry and eating without discomfort of any kind.

On the tenth day after operation he had a slight rigor and a sore throat; during the next day or two he developed pneumonia on the right side. He recovered from this in a week, but 8 or 10 days later there was a recurrence of the same symptoms, and pneumonia was found on the opposite, or left side.

After the patient had been ill this second time for a few days, there were signs of fluid at the site of the original pneumonia, and a day or two later an empyema was opened and drained on right side. From now on, the sputum, of which there was increasing quantities, became very foul. In a little less than a week, from the onset of the second attack of pneumonia, the sputum had become chocolate colored, profuse, and had an odor so filthy that the conscientious special nurse attending the case found it difficult to stay in the room for more than a half an hour at a time.

In the course of a consultation between myself and the physician who had medical charge of the case, an intravenous injection of eusol was suggested, but we were afraid of giving it, for fear of producing an œdema of the lung in a patient who already had both bases *hors de combat*. Subsequent experience has shown that this objection is not a valid one, for unless one gives a fairly large quantity of fluid and injects rapidly, no œdema ever results.

The patient gradually sank, and at last the day came when he had an almost imperceptible pulse and was semiconscious, his head lying over the edge of the bed, so that the filthy sputum ran out of his mouth with little effort. We were surely justified in thinking he had only a few hours to live.

It was then and there that 50 cubic centimeters of eusol in a little saline was given, and the next morning the patient was still alive although very ill. However, there seemed to be a slight improvement in his general condition, and the odor from the sputum was rather less.

The eusol injection was repeated, thrice within the next 2 or 3 days—each time with improving results—the sputum became normal, and the patient entirely recovered.

With regard to this case, here again no blood culture was made, and if it had been I doubt whether organisms would have been found.

The cases quoted may or may not have been septicæmia, but they are cases in which death was near as a result of acute sepsis.

However, it matters not for our purpose whether these cases for which intravenous injection is beneficial are true septicæmia or not. What is important, and particularly desirable, is that we should recognize that cases such as these, whether we call them septicæmia or toxæmia, even when they have arrived at a stage when the clinician of experience considers the end is not far off, can sometimes be saved by intravenous injections.

It has been argued with some truth that, in respect of these cases, it is difficult to build up statistics of any value, as some of the worst cases recover under any ordinary treatment, while some die in spite of all methods.

However, valuable statistics are not entirely absent. Gordon Luker of the London Hospital states that the mortality of puerperal septicæmia has decreased from 32 per cent to 5 per cent since the use of intravenous quinine. As far as the Auckland Hospital is concerned, I do not care to quote figures as I must rely upon memory, but you may take it that the reduction of mortality after the introduction of the eusol treatment was very remarkable and left no possible doubt in our minds of its efficacy. I say eusol, but it is not the purpose of this paper to flaunt the claims of eusol as against all other drugs which have been similarly used. It may be that mercurochrome and quinine for example, are even more efficacious. It is my intention rather to point out that dramatic results have been achieved by the use of almost all the various drugs which I have already mentioned, and it is to be noted that all of them have had one thing in common, their antiseptic qualities. One may suppose that they have been used because they are antiseptics. But it is difficult to think that in the enormous dilution they receive in the blood, they can act as a direct poison to the bacteria.

In some recent work, Sir Almroth Wright and his co-workers have proved, by a series of ingenious experiments that the leucocytes furnish to the serum of the blood a bactericidal element capable of killing certain numbers of microbes. This bactericidal substance can be instanteously delivered to the blood stream by the leucocytes when called upon to do so, by the introduction of either living or dead microbes. He also proved that this substance is polytrophic, i. e., it kills all microbic invaders without distinction of species.

As Wright says "it is not a very adventurous flight of the imagination to conceive that an effective vaccinating stimulus might be supplied to the leucocytes by chemical agents other than bacterial antigens." Indeed, it has been established that the blood for some hours after injection of salvarsan is bactericidal for staphylococci and streptococci.

I think it is safe for us to allege that the phenomenon described by Wright as "an adventurous flight of the imagination" is a phenomenon which is in fact of constant occurrence where the intravenous injections are employed and it appears to give a scientific explanation of what may be happening in the blood stream as a result of this injection and to justify the course of action that this paper recommends.

Intravenous injection is not only a cure for the diseased condition but is also a valuable prophylactic. Suspected cases can be prevented from developing into possible fatal sepsis, in fact for some years past it has been the custom among the obstetricians of Auckland to give doses of eusol in all cases of post partum temperature and Luker of the London Hospital says actually that "quinine given intravenously will prevent septicæmia."

Certain clinical experiences are worth nothing. The immediate effect of the injection is a rigor in nearly all cases. In some cases after injection the temperature falls to normal at once, and remains so rather like the crisis in pneumonia. In others, the temperature falls but in a few hours goes up again, and in these cases the treatment should be repeated until the temperature remains down. In a third type of case the temperature does not show any immediate alteration, but the patient feels such undeniable improvement, about 6 hours after injection, that it is probable the organisms, or their toxins, have been eliminated from the general circulation, and the continuation of the temperature will be found to be due to the original local septic focus, or else, in a day or two, an abscess will appear—in fact, the old "fixation abscess" which will require to be dealt with *secundum artem*.

CONCLUSION

In conclusion, I hope that I have made it sufficiently clear from my experience and from the facts I have laid before you that the practitioner should have the courage to adopt the remedy of intravenous injection in almost any severe case of sepsis without waiting for positive or negative results by blood cultures.

It may be that many are already using this treatment, but my excuse for discussing it is that in talking with surgeons and physicians in various parts of the world, many do not seem to have realized the dramatic results which are sometimes obtained.

CHOLECYSTECTOMY FOR HYPERACIDITY

By Dr. G. de TAKATS, Budapest

IS there a true hyperacidity in the sense of a more concentrated acid-secretion of the stomach? It has not been demonstrated in any disease, and whether it exists at all is very questionable. Whenever the usual clinical test (Ewald) reveals a high percentage of hydrochloric acid, this may be due to the following possibilities:

1. The amount of gastric juice is increased in relation to the ingested food due to: (a) increased time of action in mechanical or functional obstruction of the pylorus; or, (b) reflex irritability.

2. The secretion of gastric juice is normal, but the amount of diluting substances is lessened by premature evacuation (hypermotility).

3. Both motility and secretion are normal, but the amount of antacid substances is diminished (pyloric secretion, mucus).

It is impossible to determine with our present clinical methods, which of the above conditions are prevalent in each individual case; we are sure only that besides gastric some extragastric factors, especially the contents of the duodenum, may influence gastric secretion. According to Pawlow and his pupils fat in the duodenum depresses gastric secretion. Ivy states that meat extract, gastric juice, alcohol, glycerine, and soaps induce gastric secretion after a latent period of 30 to 45 minutes. Cohnheim and Marchand observed hyperacidity and pylorospasm when applying acetic acid to the duodenal mucosa, but hydrochloric acid inhibited gastric secretion. All experiments are uniform in proving a decided influence of duodenal juice on gastric acidity.

Clinical experience confirms this statement. Much has been written in the past few years on hypo-acidity or anacidity in gall-bladder involvement or after cholecystectomy, this being unquestionably due to a change in the duodenal contents. As early as 1893 Leva drew attention to this fact; after Glaser's publication in 1905 it was Hohlweg who showed, on the basis of extensive statistics, that after cholecystectomy hypo-acidity or anacidity was present in 83.3 per cent of the patients. Following his paper, a number of Danish surgeons (Rovsing, Rydgaard, Wessel, Fenger) published statistics, with the intention of furnishing new contra-indications to cholecystectomy; Rohde, Behm, Dangschat, and Gatewood showed that hypo-acidity or anacidity was present before operation apparently because of impaired gall-bladder function. A study of all published cases shows that about two-thirds of the patients who have had a cholecystectomy have hypo-acidity or anacidity. Animal experiments carried out by Hohlweg, Rost, and Dangschat showed anacidity after cholecystectomy. However, too much value cannot be attached to any of these experiments because it is difficult to obtain any free hydrochloric acid in dogs.

The physiological significance of the gall bladder is a much discussed subject. The problem which interests us is the change after cholecystectomy in the flow of bile as regulated by Oddi's muscle. Bile from the gall bladder is about eight to ten times more concentrated than bile from the liver (Hammarsten), so that in the absence of the gall bladder, the bile in the duodenum must be less concentrated. The common duct might undergo a compensatory dilatation and seems to do so in some of the cases, but whether this is enough to cause the same degree of inspissation has not as far as I know been determined.

Some of the dogs cholecystectomized by Rost showed a continuous dribbling of bile through the papilla of Vater as a result of the loss of sphincter tonus. Other dogs sooner or later developed continence of the muscle of Oddi, with a compensatory dilatation of the common duct. Dogs without the gall bladder secrete much less bile and pancreatic juice and Rost explains the achlorhydria in these animals by the presence of hydrochloric acid in the duodenum due to the insufficient neutralization of gastric juice. Rovsing ex-

presses the belief that the patients who show depressed gastric secretion after cholecystectomy are the same ones who lose the continence of Oddi's muscle. The question whether besides the chemical influence there are some nervous disturbances between the gall bladder, Oddi's muscle, and the pylorus, might be seriously considered and deserves investigation.

Of all these partly speculative explanations, one fact can be put down as indisputable: about two-thirds of the patients after cholecystectomy show a definite hypo-acidity or anacidity; in one-third there is no change; and in a few known cases there may be an increased acidity.

Two years ago I saw two patients in a short interval with excessive hyperacidity. Their histories in brief are:

CASE 1. Mrs. I. O. (3789–1922, I Univ. Clinic Budapest) 36 years old, has suffered from gastric disturbances for the last 10 years. Several previous examinations revealed hyperacidity and a slight gastroptosis. Duodenal ulcer was always suspected, and although no evidence could be found, the patient three times was placed on a strict ulcer diet and was kept in bed each time for 6 weeks. This seemed to relieve her temporarily. She has lost 15 pounds during the last year. Patient is of asthenic type, highly nervous, irritable, complains of very severe colic-like pain in the epigastrium coming on 4 to 5 hours after meals. She wakes up at night with excessive cramps. She suffers from constipation. On physical examination nothing pathological can be found except diffuse pain in the epigastrium on deep palpation. Gastric analysis showed a total acidity of 98, free hydrochloric acid 79, no lactic acid, blood in stools, negative. X-ray examination showed hypermotility of the stomach, no direct or indirect signs of ulcer, complete gastric evacuation in 2½ hours. In 24 hours some of the contrast meal was still in the cæcum. As the patient was suffering greatly and as another month of medical treatment did not bring relief, I advised exploration, as I was not able to exclude ulcer with absolute certainty. Laparotomy on September 6, 1922. The stomach and duodenum were absolutely free. No adhesions were found at the site of a previous appendectomy. The uterus was fixed by the round ligaments to the abdominal wall. The spleen and liver were normal. The gall bladder was distended, the wall as thin as tissue paper, with a narrow cystic duct about 4 centimeters in length. The gall bladder could hardly be emptied by pressure. The common duct was normal. No stone was palpable, no signs of inflammation were present. In the presence of this atonic gall bladder and with the hope that its removal might lower the uncontrollable acidity, a subserous cholecystectomy was done and the wound closed without drainage. Recovery was uneventful. Gastric analysis on September 20, 1922 showed total acidity 45; free hydrochloric acid, 20, no lactic acid. Roentgenogram showed normal motility with complete evacuation in 4 hours. Patient had no complaints and gained rapidly in weight. All diet and alkalies were abandoned after 6 weeks. Every 3 months chemical examination was made. Last examination a year after operation showed total acidity, 58; free hydrochloric acid, 32; no lactic acid. She has gained 20 pounds and feels completely cured.

CASE 2. Woman, age 25, Miss L. B. (3860–1922, I Univ. Clinic Budapest) presented herself in October, 1922, with hunger pain, negative physical and X-ray examination. Gastric analysis showed: total acidity, 100; free hydrochloric acid, 81; no lactic acid, no blood in stools. She had been on a Sippy diet a year before for 6 months but did not feel relieved. I suggested the operation without being able to promise any sure result. At laparotomy (October 11, 1922) exactly the same type of gall bladder as in Case 1 was found—thin walled, dark concentrated bile that proved to contain 91.6 per cent solid substances due to stagnation. The cystic duct was long; the valve of Heister could hardly be visualized. The whole organ was extremely mobile, being attached to the liver by a peritoneal fold like a mesentery, apparently the type that may become twisted. A subserous cholecystectomy was done with complete closure. Patient developed a diarrhœa for a week after the operation; then recovered quickly and gained 10 pounds in the first 2 months. She has no pains any more but fatty diet upsets her. Two weeks after the operation the total acidity was 62; free hydrochloric acid, 40; no lactic acid. X-ray examination showed no duodenal adhesions. She does heavy work and feels perfectly well.

Whether the result in these cases is just temporary or permanent, I cannot say. Both cases belong to that class of excessive hyperacidity that seldom is caused by organic lesions and is classified as functional. Hyperacidity is just a symptom and nothing is more dangerous than to advise radical surgery for a symptom due to various and partly unknown etiological factors. Many physiological problems are yet unsolved, many factors are unknown, yet in cases of so-called essential hyperacidity, in which no other cause can be found, and where a regular medical treatment has been unsuccessful, I would consider the possibility of cholecystectomy. These cases are rare. Blackford saw seven in a thousand cases, and probably some of these are relieved by a Sippy diet.

As I have mentioned above, only two-thirds of cholecystectomized patients show hypoacidity or anacidity. Whether in cases of hyperacidity a more uniform effect may be expected could be seriously considered. Abnormal conditions are always more labile and more apt to be influenced than normal conditions which the body tries to maintain by all means. As an analogy, the influence of drugs on lowering elevated and normal body temperature might be cited.

In preparing this paper, I came across one case of Dahl and one of Dangschat in which the authors performed cholecystectomy after gastrojejunostomy as a prophylaxis for peptic ulcer. I do not feel that this measure is justified.

SUMMARY

1. In two cases of "essential hyperacidity" when every other treatment had failed and subjective symptoms were prominent, cholecystectomy was performed. As in both cases the gall bladder seemed to be of an atonic type with impaired mechanism, its removal could be more easily decided upon. Relief followed in both cases extending over a year.

2. The theoretical basis of this procedure is far from being clear, and it is hoped that greater interest in this question may be aroused by this publication.

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AN ANÆMIA OF THE PUERPERIUM

WITH REPORT OF EIGHT CASES

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THE anæmias of the puerperium are varied as to their etiology and clinical picture. For the majority there are demonstrable causes; such as, hæmorrhage, sepsis, nephritis, eclampsia, et cetera. There is a group, the cause of which, from lack of study, has not been determined. The cases presented below are of this group, probably a subdivision. Several theories have been advanced as to their causation: Rowland (4) quotes Osler as referring to the "catabolic metabolism of post partum state" as the source of a hæmolytic toxin. Two of this series of 8 cases did show slight evidence of hæmolysis. Gallupe and O'Hara (2) speculate on an alteration in the biological properties of the maternal blood after the withdrawal of the direct contact with the placental contents. Minot (3) thinks sepsis the common cause and Schmidt (5) is of the opinion that it is the probable cause. There is a great deal to be said for each of these theories; but a study of the series presented below would seem to indicate that some predisposing fac-

tor residing in the patient, together with one or all the probable causes mentioned above, produces the severe anæmia.

CASE 1. Mrs. M. B. (Hosp. No. 4215), age 22, secundipara, came to the hospital June 13, 1920, complaining of weakness. She noticed this soon after her last confinement 6 weeks before admission. The delivery was normal and unattended by any undue loss of blood. Her attention was first called to her loss of color, later to the weakness. Following this she had transient attacks of jaundice, intractable diarrhœa, dyspnœa, palpitation of the heart, and for the last 3 weeks, fever. She had had influenza in 1918, mild sore throats recently, two miscarriages after the birth of her first baby.

On admission there was an icteric tinge to the skin and sclera, slight enlargement of the right lobe of the thyroid gland, soft blowing murmur, systolic in time, heard over the base of the heart. The spleen and liver were not palpable. The pelvic viscera were normal to digital examination. Her temperature was 100.2 degrees Fahrenheit, pulse 130, and respirations 35. The urine showed a distinct cloud of albumin and a few hyaline casts. The hæmoglobin was 30 per cent (Tallquist),[1] white cell count 3,800, red 1,080,000. A differential showed 50 per cent polymorphonuclears, 30 per cent lymphocytes, 12 per cent large mononuclears, and 8 per cent transitionals. The fæces were negative for parasites or ova. She was transfused with 500 cubic centimeters of citrated blood. Six days later her temperature had subsided; the red cell count was 1,740,000; white 9,600, and hæmoglobin, 35 per cent. In addition to the transfusion she was given dilute hydrochloric acid, a dram after each meal, iron, and arsenic. She did not return for further study, but her physician, Dr. H. H. Johnson of Louisburg, reported recently that she was doing well.

CASE 2 was seen with Dr. J. H. Saunders of Williamston, on May 13, 1922. Mrs. J. R. E. (Hosp. No. 5456), age 34, tertipara, came in complaining of weakness, diarrhœa, and sore mouth. These complaints had come on before the birth of her first child in 1918. Since then it had been intermittent, but worse after each pregnancy. The diarrhœa was most noticeable from 4 to 9 o'clock in the morning. She had lost 30 to 40 pounds since her first child was born. Her baby, 3 months old, was breast-fed and gaining weight. Recently the patient had noticed swelling and tingling sensations in the hands and feet. She gave a history of appendectomy in 1910, influenza with pneumonia in 1920, malarial chills and fever lately (not confirmed with microscope, and had not yielded to quinine therapy).

On physical examination she showed pallor but no jaundice, and ulcers on the buccal side of the cheeks. The spleen was not palpable. The temperature was 100 degrees Fahrenheit; pulse, 104; respirations, 20; white cell count, 2,000; reds, 1,300,000; and the hæmoglobin, 40 per cent. The polymorphonuclears were 31 per cent; lymphocytes, 64 per cent; eosinophiles, 5 per cent; blood platelets, scarce; considerable achromia, poikilocytosis, and anisocytosis. No nucleated reds or malarial organisms seen. The blood Wassermann was negative, and the fæces did not show any ova. There was no free hydrochloric acid in the gastric contents.

She was placed on dilute hydrochloric acid in dram doses after meals, which successfully checked the diarrhœa. On May 18 she was transfused with 500 cubic centimeters of citrated blood. On the following day her white cell count was still 2,000; reds, 2,370,000; and hæmoglobin 50 per cent. Seven days later the reds and hæmoglobin were about the same, and the whites had increased to 4,600. The polymorphonuclears too had risen to 65 per cent. She went home and seemed to improve on the hydrochloric acid and hæmatinics. A few months later she died after having been sick with pneumonia 3 days.

CASE 3, seen with Dr. J. C. Brantley of Spring Hope. Mrs. W. G. R. (Hosp. No. 6636), age 25, secundipara, entered the hospital June 29, 1922, complaining of diarrhœa. This had bothered her intermittently for 7 years, and had become worse since the birth of her baby, 8 months before. The baby was still nursing, entirely dependent on the breasts, but gaining weight. When first seen the patient was having 15 to 20 stools in 24 hours. She had had sore mouth frequently. On examination there was extreme pallor of the skin and mucous membrane and a systolic murmur was heard over the base of the heart. The spleen was not palpable. The urine showed a cloud of albumin and a few hyaline casts. The white cell count was 3,000, red 1,020,000, hæmoglobin less than 20 per cent; the polymorphonuclears 50 per cent, lymphocytes 40 per cent, large mononuclears 2 per cent, eosinophiles 6 per cent, and basophiles 2 per cent. The temperature was 100 degrees Fahrenheit. A suitable donor could not be obtained for transfusion. The patient was put on dilute hydrochloric acid and hæmatinics, and the baby was taken from the breasts. In a recent communication with her physician, he reported that she had apparently regained her normal blood. She had become pregnant again and delivered of a normal baby. The diarrhœa would come on from time to time, but could be controlled with the hydrochloric acid.

CASE 4, Mrs. R. G. (Hosp. No. 7438), tertipara, age 31, seen January 26, 1923, with Dr. H. M. Beam of Wood. Her chief complaint was weakness with diarrhœa which began 6 weeks before admission, just after a premature labor of an 8 months' gestation. The doctor noted very little blood loss at the time. Along with the diarrhœa, she had cramps in the abdomen, nausea, vomiting, and tingling in the hands and feet. She also had sore mouth, dyspnœa, and palpitation of the heart since delivery. She gave a history of looking pasty all her life. She had had measles, mumps, and whooping cough as a

[1] All hæmoglobin readings made on Tallquist scale and 10 per cent subtracted.

child; sore throats during her illness. She had two living children and had had seven miscarriages.

On examination, the skin and sclera showed a slight yellow tinge. There were small ulcers in the mouth; the spleen was not palpable. There was œdema of the lower extremities with blebs on the anterior tibial surfaces, lower third. The temperature was 100.2 degrees Fahrenheit, pulse 100, respirations 30. The urine showed a heavy cloud of albumin, and many hyaline casts. The white cell count was 13,800; reds, 1,750,000; hæmoglobin, 30 per cent; polymorphonuclears, 78 per cent; lymphocytes, 19 per cent; large mononuclears, 1 per cent; eosinophiles, 2 per cent; marked anisocytosis, poikilocytes, and the platelets diminished in number. Her blood Wassermann was negative; the husband's was two plus. A blood culture was negative; the fæces negative for ova. A suitable donor for transfusion could not be found, so she was told to take dilute hydrochloric acid and instructed to stay in bed. Dr. Beam reported she would do neither, and she died a few weeks after returning home.

Case 5, seen with Dr. H. Palmer of Hollister, February 21, 1923. Mrs. J. S. (Hosp. No. 7517), age 22, secundipara, was brought into the hospital unconscious. It was evident from the red cell count, 570,000, and the hæmoglobin estimation, 10 per cent, that she needed blood first of all. Her sister's blood was found compatible, so she was transfused with 500 cubic centimeters, citrate method. She regained consciousness and the next day gave the following history: She had been well until she was married, and had never been jaundiced. She remained in bed a month after the delivery of her first baby; nursed a healthy child until it was 2 years old. She was pale and thin during the whole of her last pregnancy. After her baby was born, 6 weeks before admission to the hospital, she had complained of diarrhœa which was worse early in the morning. There was loss of appetite, no sore mouth, nor tingling in the extremities. She began to have high fever, 104 degrees Fahrenheit, 4 days before admission. She had had influenza 4 years before, sore throats since the birth of her baby, and measles and whooping cough as a child.

On examination she showed pallor, prominent tonsils, and moderate enlargement of the thyroid gland. A blowing systolic murmur was heard over the base of the heart; the spleen was not palpable, and the urine was negative. The day after transfusion, the whites were 4,000; reds, 1,400,000; temperature 102 degrees Fahrenheit, pulse 140, respirations 24. She was put on hydrochloric acid and hæmatinics. Three days later temperature and pulse normal, reds 1,790,000, whites 7,600, hæmoglobin 30 per cent. A year later her doctor reported she was apparently well.

Case 6, Mrs. G. N. C. B. (Hosp. No. 7612), age 26, secundipara, seen with Dr. J. P. Speight of Rocky Mount. She entered the hospital March 26, 1923, complaining of weakness and shortness of breath. She had not felt well since her first delivery 3 years before. In addition she complained of heart burn, sour eructations, headache, and vertigo. Her condition had become worse since the birth of her baby 3 weeks before. She had had eclampsia with both deliveries. Also gave a history of kidney colic with fevers and chills, and had had influenza the December before. The skin and mucous membrane showed pallor only. There was a blowing murmur heard over the base of the heart; the spleen was not palpable. The uterus was large and tender; the cervix lacerated. The urine showed considerable albumin and pus, a few hyaline casts. The hæmoglobin estimation was 20 per cent; red cell count 1,280,000; whites, 3,800, polymorphonuclears 69 per cent; lymphocytes, 19 per cent; large mononuclears, 7 per cent; transitionals, 4 per cent; eosinophiles, 1 per cent. Achromia was marked, only slight poikilocytosis and anisocytosis. Blood platelets were scarce; blood Wassermann was negative. She was transfused with 500 cubic centimeters of citrated blood. The following day, the white cell count was 7,000, reds 1,560,000. She was placed on hydrochloric acid and forced feedings, and was not heard from again until April 1, 1924, when she came in complaining of dizziness on stooping. At that time the white cell count was 10,800; reds, 2,440,000; hæmoglobin, 40 per cent; polymorphonuclears, 54 per cent; lymphocytes, 34 per cent; large mononuclears 10 per cent, eosinophiles 2 per cent. Platelets were apparently normal in number. She still had slight anisocytosis and poikilocytosis.

Case 7, Mrs. E. W. (Out Case No. 1558), age 18, primipara, also seen with Dr. Speight of Rocky Mount, August 23, 1923. She was complaining of nausea and weakness. Her baby had a normal birth, was 8 weeks old and breast fed and thriving. After her delivery the patient became "run down." She tired easily, had shortness of breath, and palpitation of the heart. There was no diarrhœa associated with the nausea; no tingling of the hands and feet. On examination there was marked pallor of the skin, a blowing systolic murmur heard over the base of the heart. The spleen was not palpable. The extremities were slightly œdematous, and there was some tenderness in the right tubo-ovarian region. The temperature was 101 degrees Fahrenheit; pulse, 110; respirations, 24; hæmoglobin, 15 per cent; red cell count, 970,000; whites, 5,800; polymorphonuclears, 79 per cent; lymphocytes, 18 per cent; large mononuclears, 3 per cent; marked anisocytosis and poikilocytosis. The blood Wassermann was negative. She was transfused August 25, and instructed to take the baby from the breasts, stay in bed, and take hydrochloric acid. She was not heard of again until October 14, 1923, and her red cell count then was 1,070,000; hæmoglobin, 20 per cent. She had not weaned the baby, stopped her work, nor taken the medicine. She went out of town just after that and died a few weeks later.

Case 8, Mrs. C. B. (Hosp. No. 8348), age 18, primipara, seen with Dr. J. D. Hemmingway of Bethel. She entered the hospital September 26,

1923, complaining of weakness and diarrhœa. Her baby was eight weeks old. Not much blood loss at delivery. Noticed after the baby was born that she was becoming progressively pale and weak. Her appetite was good, but the food seemed to pass through undigested, and she would have colicky pains till the intestinal tract was emptied. The bowels moved ten to twelve times in 24 hours. She had been "constipated always" before the birth of her baby.

On examination she was pale but not yellow. A blowing murmur was heard over the base of the heart, the spleen was not palpable. The temperature was 101 degrees Fahrenheit; pulse, 110; respirations, 22. The urine had a cloud of albumin. The red cell count was 1,070,000; whites, 4,800; polymorphonuclears, 54 per cent; lymphocytes, 22 per cent; large mononuclears, 6 per cent; transitionals, 1 per cent; eosinophiles, 1 per cent; myelocytes, 16 per cent; blood platelets, scarce; marked anisocytosis and poikilocytosis. A suitable donor could not be obtained so she was placed on hydrochlic acid and hæmatinics, and the baby was taken from the breasts. She came back a month later and her red cells were 3,750,000 and hæmoglobin 70 per cent.

RÉSUMÉ

The age incidence was from 18 to 34; 2 patients were primiparæ, six multiparæ. Only 2 showed pigmentation of the skin and this was not a lemon yellow tinge. Sore mouth and tingling in the extremities were found in 3. The white cell count was below 6,000 in 7, and the same number had a color index of 0.8 and above. All 8 had gastro-intestinal symptoms indicative of a low hydrochloric acid content, and the acid was given in all cases. Kidney disturbance might have been the etiological factor in 1. The smears on 5 were noted to have achromia, anisocytosis, and poikilocytosis. Only 5 were transfused, because donors could not be found for the other 3. Of the 2 deaths, 1 had been transfused and the other had not; neither took the medicine prescribed. The one who died from pneumonia might have stood a better chance if she had not had the anæmia, but the anæmia *per se* could not be considered as the cause of her death. In all the cases fever appeared in the latter part of the illness varying from 1 to 5 degrees Fahrenheit.

The anæmia, progressive in spite of ordinary therapeutic measures, the gastro-intestinal symptoms, leukopenia (with one exception), high color index, anisocytosis and poikilocytosis, would be indicative of primary pernicious anæmia. Against this diagnosis are the absence of remissions, and any evidence of hæmolysis. The yellow tinge seen in two of the patients could have been due to a mild catarrhal jaundice, very probably present, as indicated by the associated gastro-intestinal symptoms. Furthermore one of these had a leucocyte count of 13,800.

The blood picture alone, the progressive anæmia, low white cell count, and when noted, diminished platelets, would indicate a deficiency in the hæmatopoietic system. Might not some toxin have caused this deficiency as is recognized in secondary aplastic anæmia?

In this connection, Professor Valdemar Bie (1) reports a case of "pernicious anæmia" which was relieved by the "introduction of hydrochloric acid into the stomach." He gave it on the theory that "there are harmful organisms thriving in the small intestines on account of insufficient hydrochloric acid; the toxins of the organisms give rise to the anæmia." His patient, a man, was known to have had achylia with diarrhœa 13 years before the anæmia was demonstrated. Under this treatment in 2 months, the red cell count rose from 2,400,000, to 5,080,000, and the hæmoglobin from 53 per cent to 102 per cent. He continued the hydrochloric acid and three and a half years later the count was 5,120,000, and the hæmoglobin 98 per cent.

There is some analogy between his case and those reported above, as regards the treatment with hydrochloric acid. Transfusion was helpful in getting the blood count started upward, but alone it could not keep the blood going sufficiently to sustain life (Case 7). The patients in Cases 3 and 8 did not receive the transfusion, but recovered on the hydrochloric acid, along with other general measures.

Still another resemblance in this series to the case of Professor Bie, is that 5 of the 8 gave a definite history of a long standing impairment of health before the anæmia was demonstrated or became troublesome.

SUMMARY

1. There is an anæmia of the puerperium, which without obvious cause, becomes alarmingly severe and even fatal.

2. Up to the present time no definite classification has been given this anæmia of the puerperium.

3. One transfusion is of value, but alone is not sufficient.

4. Hydrochloric acid is of distinct value; and the deficiency may be an etiological factor.

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TUBERCULOSIS OF THE MAMMARY GLAND

Occurrence—Case Report[1]

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TUBERCULOSIS is one of our most widespread diseases affecting, as we all know, the lungs, meninges, kidneys, peritoneum, bones, and in fact, all of the organs of the body. When we consider this widespread disease and the fact that it is so seldom seen affecting the mammary gland, we are struck with the fact that tuberculosis of the breast is an extreme rarity. Of late, several articles have appeared on this subject: One by Dan Collier Elkin (6) of Boston in which a thorough review of the literature is given; also a very complete article is written by Leavitt (8) of Brockton, Massachusetts, in which he makes a complete report of his study of this condition and includes descriptions of two cases which had been presented at a meeting of the Boston Medical and Surgical Society.

Tuberculosis of the breast was first described by Sir Astley Cooper (2) in 1829, who called attention to the gross appearance of the lesions and referred to it as "scrofulous swelling of the breast." Lancereaux (7) in 1860 was the first to make a diagnosis from an examination of the histological structure of the part. DuBarr (4), in 1881 was the first to describe the microscopic appearance of the pathology. He referred to two types, the nodular or discrete, and the confluent. In 1914, Deaver (3) reviewed the literature and included a report of 74 cases which had been reported between 1904 and 1914, 5 of which were in his own practice. Durante and McCarty (5) of the Mayo Clinic reported in 1916 the incidence of 0.51 per cent in over 11 years in relationship to other pathological conditions of the breast. Cheever (1) in 1921 reported four cases in a total of 228 cases at the Peter Bent Brigham Hospital since 1913, an incidence of 1.7 per cent.

From the above statistics it will be seen that this condition is unusual, that its pathology is interesting, and that tuberculosis of the breast is almost invariably limited to one side. The process is fundamentally the same as in any organ except for certain peculiarities of the breast tissue. There are three distinct types: first, the disseminating; second, confluent; and third, the sclerosing. The manner of infection is similar to that of other glands; that is, by the lymph, blood, or by direct extension. The breast has a fourth possible avenue of entrance for the infection, that is, through the skin itself. The method of entrance being by means of a cracked nipple.

The general appearance of the nodular or discrete is that of a small lump in the breast. It is usually found in the upper, outward quadrant. When seen early the gland is movable, the skin over it presents a calf-skin-like appearance, and later redness and inflammation appear. The nipple may be retracted early or late, the glands in the axilla are about equally present or absent in

[1] Read before the Hippocrates Society of Washington.

the early stages. The growth is usually slow and does not cause any pain until necrosis has occurred and the entire breast has broken down. The axillary glands become involved in the later stages in about 70 to 80 per cent of the cases. Necrosis appears. In the later stages there are abscess cavities deeply situated within the glands and numerous tubercles; and sinus tracts connect the abscess cavities to the periphery of the gland.

In the *disseminating* type the nodules remain distinct or form a single nodular mass undergoing caseation at the center and sinus tracts are numerous. There are many tubercles and large areas of necrosis.

The *sclerosing* type is characterized by a diffuse hardening in which the processes overlie deep abscesses, or in which the whole lesion is essentially fibrous, which is rare. In this condition, the breast may be involved as a part of the general miliary tuberculosis.

The etiology of tuberculosis of the breast shows that it is essentially a disease of the female breast and only 11 cases so far have been reported in the male. Of the cases collected by Deaver (3) 70 per cent occurred between the ages of 20 and 50. Heredity plays the same part as it does in other forms of tuberculosis. The history of trauma is an important factor in that a definite injury may predispose to tuberculosis of the breast, as in the case reported here.

The symptoms and causes of the diseases are not significant in themselves. The most frequent initial complaint is a lump in the breast, usually noticed without pain. Pain is present only in the later stages. In the early stages of tuberculosis of the breast suppuration may occur, the lump becoming necrotic and soft, the skin adherent and red over it, and finally, if not opened, rupture spontaneously with formation of a distinct sinus. The axillary glands may become involved, and in about 70 per cent of the cases, break down toward the later stages and make multiple abscess formations with sinus tracts which are persistent.

The symptoms and signs, as outlined above, appear regardless of which type of tuberculosis we are dealing with. It may be a primary infection involving the mammary gland itself, or it may be a secondary condition as a sequel or metastasis of a focus from some other portion of the body. If the condition is of a secondary origin, symptoms and signs of a primary focus are present, such as pulmonary tuberculosis, which is the usual site.

In arriving at a diagnosis the following conditions must be considered: (1) carcinoma, (2) fibro-adenoma, (3) interstitial mastitis, (4) actinomycosis, (5) gumma, (6) chronic pyogenic infection, and (7) tuberculosis.

The prognosis of the disease is good in the primary type, if complete amputation of the breast is done, that is, a complete removal of all breast tissue. If in the secondary type, the prognosis then is directly dependent upon the primary factor or the pulmonary condition, plus surgical removal of the breast.

With *carcinoma* of the size of the tuberculous breast we would find large hard axillary glands, retraction of the nipple with the possible attachment of the nipple to the pectoral fascia, larger and more indurated ulceration, and a bloody discharge with no definite sinus formation.

In *fibro-adenoma*, these are usually well encapsulated, and there is no change in the overlying skin and no gland involvement.

In *mastitis*, there is no ulceration of the skin or general enlargement. In this condition usually the entire breast is enlarged.

Actinomycosis of the breast is very rare and is characterized by the Ray fungus.

A Wassermann reaction would help us rule out the presence of *gumma*.

Chronic pyogenic infections would hardly show a tendency toward persistent sinus formation, and would have more acute signs with fever, chills, etc., and are amenable to more simple surgical treatment.

TREATMENT

The treatment of this condition is complete removal of the breast, dissection of the axillary glands, and removal of pectoral muscles if the glands are involved. If the disease is early and no glands are present and the sinuses have not reached the pectoral fascia, complete removal of the entire breast tissue will suffice, and postoperative X-ray is indicated as in other forms of breast tumors.

CASE REPORT

M. B., age 13, female, colored. Nativity, Maryland. Occupation, school girl. Patient was first admitted to Providence Hospital on June 12, 1922, on the surgical service of Dr. W. B. Marbury. The family history was negative and showed no evidence of tuberculosis. She had had whooping cough and influenza in childhood with good recovery. First menses were at age of 13, in March, 1922, 4 months prior to admittance. She has had three menses since, the last one being in May, 1922.

Present illness. While sleigh-riding in February, 1922, she struck her left breast. There was some soreness at this time, but it soon disappeared. In March she began to notice a feeling of fullness in the breast, and a return of the soreness in the upper left quadrant. The breast was lumpy to touch It was hard, somewhat nodular, and larger than the right. It became ulcerated and in April, 1922, the physician at her home in the country opened a small abscess. She had no history of any other glandular enlargement; no history of cough or any pulmonary signs. She was admitted to the hospital and kept under observation by Dr. Marbury at this time and complete examinations including an X-ray of her chest were negative. The blood picture and Wassermann reaction were negative. She was well-nourished and hæmoglobin was 80 per cent.

Upon examination at this time Dr. Marbury said that he felt a hard mass in the deep tissues of the breast, especially in the left and right upper quadrants. There was a small fluctuating mass, also a hard mass in the deep breast tissue. There were two ulcerating areas found in the upper right quadrant and the scar of the old incision with a discharging sinus in the left lower quadrant. Dr. Marbury, at this time, suspected tuberculosis of the breast and sent the patient to the operating room where an operation was done on June 21, and incision made over the old sinus under local anæsthesia, and a specimen of the tissue removed and examined by Dr. Neuman. Dr. Neuman reported an inflammatory condition. A small mass of tissue was removed around the infected skin area, and the wound was closed routinely. The patient returned to the ward in good condition, and made an uneventful recovery except that the line of sutures in the breast broke down and some necrosis occurred, and the sinus tract still persisted. She was discharged from the hospital on July 9, 1922, and was told to return to the dispensary for dressings. She was treated from this time up until August 8 at the dispensary where no progress was made.

The condition became, in fact, worse. Two sinus tracts formed which discharged a small amount of necrotic tissue. She was admitted to the hospital for the second time on August 8, 1922, and came under my observation. Her history was as stated above. The physical examination of her breast at this time showed three large sinus tracts with two ulcerated areas, and the breast was twice the normal size. Diagnosis of tuberculosis of the breast was definitely made and operation advised. Before the operation, however, another thorough clinical examination was made, including X-ray of chest. All examinations were negative.

An operation was done on August 11, 1922, and the complete removal of the right breast was made. The pectoral muscles were not removed. No glands were found in the axilla and the pectoral fascia was not affected. The skin was closed in the usual manner and a drainage tube inserted through a counter drainage opening. The entire breast was sent to the laboratory for examination, and Dr. Neuman made the following report, stating that it was a chronic inflammation, characterized by the presence of an occasional tubercle and a few giant cells. He stated that it was definitely a tuberculous process.

The patient made a good recovery; the wound healed by primary union, and she was discharged on the fifth of September, 1922. A letter written to her in our follow-up system of records at the hospital, stated that one year after her operation she was well and had no trouble from her breast, although there was evidently some slight keloid condition of the scar.

My purpose in reporting this case is to bring to the attention of the society a rare manifestation of a very common disease, and in conclusion, I wish to say that

1. Tuberculosis of the breast is a rare disease, especially so in a patient of 13 years.
2. The source of infection is questionable, being either primary or secondary. It was undoubtedly primary in the case reported.
3. A history of trauma preceded the disease in this case.
4. A diagnosis is sometimes very difficult, especially between carcinoma and tuberculosis, and also, as in this case, between tuberculosis and pyogenic infections or general inflammatory processes.
5. Operation gives excellent results, the type of operation depending on the extent of the infection and the amount of tissue involved.

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THE LOW OR CERVICAL CÆSAREAN SECTION (LAPAROTRACHELOTOMY)

UNDER LOCAL (INFILTRATION) ANÆSTHESIA[1]

BY JOSEPH B. DELEE, M.D., F.A.C.S., CHICAGO

LOCAL anæsthesia is occupying a wider field of application in surgery all the time and for the last two years I have been employing it for the low, or cervical cæsarean operation, the laparotrachelotomy. While I was an adherent of the classical section, I used local anæsthesia for this operation on many special occasions, but now, having been so successful with it in the more difficult cæsarean I feel that it should be the routine anæsthetic for the performance of the old method.

The realization of the dangers of general anæsthesia is very tardy; indeed, many operators even today do not admit that methods for local anæsthesia possess sufficient superiority to repay the extra effort, time, skill, and personal wear and tear required for their successful performance. While I have used local anæsthesia on frequent but selected occasions in both gynecology and obstetrics ever since Einhorn discovered novocain in 1905, I have seriously considered its routine application to laparotrachelotomy during the last few years only, in which time I have devoted most of my thought to the perfecting of this operation.

At the Chicago Lying-In Hospital 338 laparotrachelotomies have been performed by 8 operators. Of these patients 2 died (less than 0.66 per cent), 1 from ether pneumonia. There were 6 other cases of pneumonia and 19 of severe ether bronchitis. In 3 of the pneumonia patients the wound suppurated, and 2 developed phlegmasia alba dolens. In several of the bronchitis cases there was also more or less suppuration of the wound. I have therefore felt that if we could get rid of ether anæsthesia we would eliminate a great deal of our morbidity and keep down the mortality of this operation to one-third of one per cent.

The anæsthetic used in our operations is ether, only occasionally gas or ethylene, and we employ 2 physicians, specialists in this department of surgery. They instruct the internes who care for the cases not handled by the anæsthetizers themselves. Nurses do not administer anæsthetics. In spite of these precautions I am not satisfied with general anæsthesia, including ethylene. Our results are no better than they have been for 35 years, and I have had the same troubles in all the many hospitals in which I have worked during this long time. Because of these results we surgeons are searching for new general anæsthetizing agents such as ethylene, acetylene, ethyl chloride, etc., and are replacing general with local narcosis.

Is it not time to take stock of our general anæsthetics and review the successes and failures resulting from the use of each one and to measure them by modern standards? Since ether is the agent employed by us and also the one most generally given; and since all the other general narcotics possess its bad qualities in varying degrees, I will discuss only this drug, and that briefly.

Statistics show that when ether is used 1 patient in 5,000 dies while 1 in 2,000 dies when chloroform is used. In 6 years we gave ether to 12,622 women, 7,475 to the obstetric degree, 5,147 to the surgical. We had 2 deaths on the table, 1 from heart dilatation, 1, 2 hours after operation, cause unknown, and 2 from ether, aspiration, pneumonia. After this experience I do not hesitate to say that many immediate and late fatalities from ether are not recorded, and many are not even recognized as such.

Postoperative ether pneumonia results from the following causes:

1. Aspiration of oral secretions and regurgitated vomitus into the lungs. Fenger, 35 years ago, warned of the danger from bad teeth and tonsils and insisted on the use of the toothbrush and hydrogen peroxide before operations.

[1]Read before the Chicago Gynecological Society, November 21, 1924. (For discussion see p. 207).

2. The reduction in local immunity of the lungs. The local immunity is reduced by the cooling of the respiratory tract, by the petechial hæmorrhages in the mucosa, by the actual toxic action of ether, and by the disturbance of the respiratory function through the asphyxia and acidosis produced by the general action of the toxic agent.

3. Decreased respiratory action because of pain in the epigastrium or general abdominal cavity. (Operations in the hypogastrium, especially those with Pfannenstiel's incision give the least trouble). When laparotomy is done on a pregnant woman near term the fundus may seriously interfere with respiration until the child is delivered.

4. Septic emboli from the site of the operation. In these cases the symptoms are mild at first and pneumonia develops later than after aspiration into the lungs of infected material, when symptoms come on at once, often within a few hours. Bronchitis following ether has the same etiology and I always suspect some bronchopneumonia when a patient has fever and cough after operation.

An important matter, too frequently overlooked, is the relation of general septicæmia and of suppuration in the wound to an infective process going on in the lungs. The bacteria are transported from the lungs to all points of lowered resistance, particularly the site of operation, with its dead spaces filled with blood and serum, its tissues injured by handling or constricted by ligatures, and its immunities weakened by exposure, by the general acidosis, or by hæmorrhage, which likewise reduces the general immunities against infection. This cause of mortality and morbidity has already shown up in our results and, more and more, as we scrutinize each case closely, do we find it at the bottom of our infections.

Other disagreeable and dangerous results from ether are: (1) symptoms of acidosis, thirst, vomiting, tympany, ileus, headache, coma, death; (2) shock, immediate or delayed; (3) obstructed respiration from profuse secretions, swelling of the bronchi, dropping back of the tongue,—the labored breathing throws extra work on the heart, acute decompensation sometimes resulting—; (4) vomiting after operation and distraction of the wound, hernia resulting; and (5) the indirect danger of general narcosis—as emphasized by Farr—which misleads the operator into a faulty, i.e., a rough and traumatizing, surgical technique, with postoperative complications as a sequence.

At the Chicago Lying-In Hospital 5 operators have performed 67 laparotrachelotomies under local anæsthesia alone or aided with a little ether or gas, and we are amazed at the freedom of the patients from the above mentioned disabilities. At first I only recommended it to my patients but, slowly, as the beauties of their recoveries became apparent, I found myself urging it with a greater attempt at persuasion. While of course I do not insist on local anæsthesia I try to get all patients requiring section at least to permit me to start the operation in this way, promising to give ether or gas should pain be experienced or, what is more likely, the "nerve" default.

Here is the crux of the whole situation. If we can get the patient's mind in the right condition, if we can establish her faith in the operator and the method of anæsthesia, the battle is won, the rest is in the surgeon's hand and if he knows his art success is certain.

One must be a psychologist and one must possess what King Solomon called an "understanding heart." Each patient requires a special psychological approach. I have been able to distinguish the following types:

1. Rational patients who listen to reason and have control of the emotions. These are usually high-bred women of the intellectual classes. The operator can rely on them to help him succeed by voicing their complaints honestly. They do not suffer any psychic shock.

2. Patients who are not convinced but suffer a painful suppressed apprehension throughout. These are women from all classes of society. The operator may go a variable distance with them, usually requiring a little gas for the painful parts of his manipulations. These women may suffer psychic shock, but this possibility is much diminished by morphine and scopolamine administered directly the child is born.

3. Those who express apprehension continually, who cry, or squirm throughout, even when suffering little or no pain. These are from the lower or ignorant classes, and are those women, poor or rich, who have never been taught self control. Morphine and scopolamine do not help these women very much and it may become necessary to use general anæsthesia. Psychic shock is rare.

4. The cold, stolid type. These are women whose pain sensation is either undeveloped or blunted by hardship and the stern realities of a rigorous existence.

How to handle each kind of mentality and disposition must be learned unless the accoucheur is gifted with psychological instinct and a compelling personality.

If there is time—days, weeks or months—I prepare the patient's mind beforehand. The most difficult situation to overcome is a result of the widespread tradition that such operations must be done under general anæsthesia. If the public could be instructed that not only is it possible but safer to do these operations under local anæsthesia, the way would be easy. I first ask the patient if she prefers local to general anæsthesia. Then I explain the possibilities and immense advantages of the local. I let her read a large number of letters and affidavits given me by my former patients extolling the virtues of the new anæsthesia, and I let her converse with one or more upon whom I have already operated. One of the most persuasive arguments is the promise that if there should be any pain, general anæsthesia will be started at once. However, I always say there will be a little pain and that for this I will give, if desired, gas or ether.

On a few occasions I have not informed the patient that she was not to be put asleep but have proceeded with the operation explaining the absence of inhalation in ways suitable to the occasion. One patient was allowed to smell a mixture of alcohol and ether; another was carried along until actual delivery was imminent, then given nitrous oxide and oxygen for 3 minutes, after which the operation was completed as usual. As a rule, however, it is better, I believe, to deal openly with the woman and obtain her cooperation.

We do not give morphine or any other narcotic before the delivery of the baby as we have found many children are narcotized and require prolonged efforts at resuscitation.

We have tried the effects of music on some patients, as Farr does in Minneapolis, but we cannot boast the success he has obtained. Some of our patients like to hear the phonograph going, others do not; most prefer fine violin music, a few ask for jazz. I believe that this psychological element could be developed into a powerful adjunct. At present I use it as a talking point in the preparation of the woman's mind.

We use 0.5 per cent novocain, to each ounce of which 2 drops of 1:1000 adrenalin are added, after it is sterilized. The water used is twice distilled in Jena or Pyrex glass containers, the novocain added, and the solution then sterilized in the autoclave for 30 minutes. While we prepare 12 ounces of this solution, we have never used more than 10; the average is 7, the least, in one case, 3½ ounces. It is never kept over 24 hours. Everything is ready in the operating room before the patient is brought in and we try to avoid all disturbing noises, clanking of pans, instruments, conversation, etc. It is also very important that the patient should not understand what is going on about her. We, therefore, have invented a set of names for the various instruments used and the different procedures. For example, we ask for a "Bard-Parker," not a knife; a "Mayo," not a sponge; a "lap," not a pad; a "Priscilla," not a needle; a "Murphy," not an artery forceps, etc. Instead of saying "sponge" we say "touch," "*Kara*" means to cut, etc. Occasionally we motion for instruments with the fingers.

Since the operation is very long, it is necessary to arrange the patient in a perfectly comfortable position on the table, using numerous pillows, especially under the back and over the shoulders where the iron braces are. Most women complain more of the back and the strained posture than of the pain of the operation. The knees but not the hands are tied down.

The method of infiltration is the usual one. With a fine needle a wheal is made in the

skin at the upper end of the proposed incision. Then a long needle is inserted and the solution is injected under the skin throughout the length down to the pubis. At every inch the needle is forced upward from beneath into the skin itself, making a wheal here. As the needle is being withdrawn the solution is deposited on each side of the line of incision. We take plenty of time and *always keep the needle moving* to avoid injecting directly into a vein. After the skin is benumbed, a little novocain is injected into the fat, but this tissue is not sensitive except near the pubis.

Now the skin and fat are incised with a perfectly sharp skin knife which does not press in on the belly. Just before the deep layer of the superficial fascia is reached we desensitize the fascia. A new short needle is substituted for the long one and the solution deposited systematically just under the fascia. Near the pubis we use more of the medicine and it must be injected, slowly, into the fascia itself. This part is the slowest to become insensitive and requires more of the drug, and more time. Most failures are due to haste.

After a few minutes' wait we proceed to open the fascia, using a new sharp knife instead of scissors which make disagreeable clicking and crunching noises. Now the fascia is lifted up and 5 cubic centimeters of the solution is deposited near the outer border of the rectus muscle on each side, and in 3 places. The terminal intercostal nerves enter the rectus sheath here, and by benumbing them the parietal peritoneum is desensitized. In addition we inject some more solution under the peritoneum itself, for a distance of 6 centimeters on either side of the proposed opening and down over the bladder to the pubis and into the cavity of Retzius. We keep the needle moving while injecting.

Now the peritoneal cavity is opened. The next step in administering the anæsthetic is to inject 20 cubic centimeters of the solution into the subperitoneal space of the vesico-uterine plica. With the fingers this is worked down beneath the bladder and outward to the region of the broad ligaments.

An important element of success is the kind of abdominal retraction employed. Gentleness, gentleness, and again and again gentle handling is the keynote. All the assistants must be trained to appreciate this fact. The organs must be left *in situ* as far as possible, and all pulling and tugging scrupulously avoided. Each motion must begin slowly and end slowly. We do not desensitize the uterus itself unless the patient is in active labor. Then a few cubic centimeters are injected in the line of proposed incision. If the bladder is very tender we place a few cubic centimeters under its lowest portion.

Now comes the delivery of the child and we cannot render this part painless by infiltration. I ask the patient if she wants a little gas, or if she can stand a few moments of pain. About one-half of the women can and do stand the pain. As soon as the baby is out we stop the gas, and by the time the woman is fully conscious we have the placenta delivered and the 3 hypodermics administered —cubic centimeter of strong pituitrin, ¼ grain of morphine, and 1:200 of scopolamine. The placenta is usually delivered by traction on the cord, aided by the uterine expulsive efforts. This is less painful than the insertion of the hand. Several women have remarked that the delivery of the placenta was the only painful part of the operation.

The closure of the wound usually proceeds uneventfully, but sometimes it is necessary to inject a few cubic centimeters of the anæsthetic into the peritoneum near the round ligaments. If packs are to be inserted the abdominal wall must be tenderly elevated and the pads placed by sight and without friction on the peritoneum. For their removal it is usually necessary to give a little gas.

The technique of the operation is not modified by the local anæsthetic. The surgeon must work slower, and cannot pull and strip the tissues as he has been accustomed to do, having to use the knife more, with delicate sharp dissection. This by eliminating trauma is a great advantage and contributes largely to the almost uniform primary healing of the wound.

THE INDICATIONS FOR LOCAL ANÆSTHESIA

I hold that novocain should be the anæsthetic of choice for all cæsarean sections, in-

cluding the low, cervical, or laparotrachelotomy. The most common contra-indication is a failure on the part of the patient to respond to reason, a result of defective bringing-up, or defective nervous and mental anlage. The technique is also contra-indicated when the surgeon lacks faith or cannot or will not sacrifice the time and effort and wear and tear successful local anæsthesia demands.

Heart disease is not a contra-indication. It is conceded that ether is well borne by cardiopaths, but our records show that the heart is more excited and beats more rapidly when ether is administered than when the patient faces and fears the approaching ordeal under local anæsthesia. The heart therefore is called upon to do actually less work under local anæsthesia. The postoperative vomiting from ether anæsthesia is also a severe strain on a weakened heart.

Eclampsia and threatened eclampsia are not contra-indications. Indeed, I believe local anæsthesia is the method of choice in these cases. We know that the alkali reserve in eclamptics is reduced, and we know that general anæsthesia creates acidosis in normal individuals and augments that of eclamptics enormously. This accounts, in part, for the high mortality of operations in the eclamptic states. The women do not recover from the anæsthetic, sink into shock and coma, and die. As an aid to sugar, soda and insulin in combating acidosis local anæsthesia is added.

I am fully aware that this recommendation is diametrically opposed to my own former teaching and to that of all writers on eclampsia. We taught that the convulsive patient should be kept in a dark, quiet room, free from all external irritations to forfend the outbreak of convulsions. I am so impressed with the risks of general anæsthesia in such cases, deaths from acidosis, pneumonia, and pulmonary abscess being frequent, that I hold the dangers of a few convulsions to be less than the former. Just last month Frey of Switzerland expressed a similar view.

Diabetes. Mental shocks are considered especially dangerous in diabetics but if hyperglycæmia and acidosis are evoked or aggravated by general anæsthesia, as Pemberton and Cunningham claim, it would be well to weigh the advantages of local anæsthesia. I had only one case of diabetes in this series and she had been under good treatment for months. Her case was one of the most successful in all respects.

Active labor. We formerly thought that we could not use local anæsthesia when labor was in progress, with the pains coming 6, 5 and 3 minutes apart. We felt that it was unkind to add to the woman's parturient sufferings. As the blessings of the local method grew to such striking proportions we tried it in some cases of dystocia during active labor and now have done 24 such operations with gratifying success. One woman, with a contracted pelvis, had a threatening degree of thinning of the lower uterine segment and pains every 2 minutes. In this case the operation was a perfect success. In one case the labor pains were very severe and the patient unruly. We gave nitrous oxide and oxygen for each pain exactly as we do in normal labor. We deepened the anæsthesia, likewise, for the moment of delivery of the head, the rest of the operation being completed as usual. I believe that with modifications of our technique, suggested by further experience, we shall be able to give almost all patients in active labor the benefits of local anæsthesia.

Special indications for local anæsthesia will be found in cases of cold in the head, bronchitis, pneumonia, and tuberculosis. In all cases of disease of the air passages, including sinus and tonsillar infections and bad teeth, one should try to persuade the patient to have local anæsthesia as a necessity for her health. Influenza during pregnancy and labor was a fatal complication, especially if an anæsthetic had to be given. We did not believe that emptying the uterus favorably influenced the course of the disease and therefore did not induce labor in any of our cases. Where such an operation would appear indicated of course local anæsthesia should be employed.

Chronic nephritis. No one will question the necessity of local anæsthesia in these cases, nor in those in which the liver is involved, as in cases of acute yellow atrophy, hyperemesis, etc.

LOCAL ANÆSTHESIA AND OBSTETRICAL INDICATIONS

This is an interesting development. The safety of laparotrachelotomy as compared with the old classic section is such that we are permitted to extend the indication for abdominal delivery into fields hitherto unthought of, and now by reducing the hazard still further in eliminating the dangers of general anæsthesia, we may confidently recommend the low cæsarean where formerly we would have hesitated a long time.

I am fully aware of the notorious fact that too many cæsarean sections are being done. The simplicity of the old classic operation compared with the complicity of vaginal delivery has misguided most surgeons with the result that they resort to abdominal delivery in all cases of dystocia and 266 women died in the United States in 1922 following cæsarean section. This counts neither those dying from puerperal albuminuria and convulsions, nor those dying from puerperal infection and embolism. Nothing could be further from my intention than to augment the number of such operations. On the contrary I feel that if the low, or cervical cæsarean becomes an established practice, and if local anæsthesia becomes, with it, the accepted method, the mortality of cæsarean section will be diminished through the safety inherent in the anatomical location of the opening in the uterus, and in the local anæsthesia and in addition to these through the actual number of abdominal deliveries being automatically reduced.

Space does not allow a discussion of the various indications. Suffice it to say here that in a borderline case in which the conditions for abdominal and vaginal delivery are about evenly balanced abdominal delivery should be selected as the dangers of anæsthesia could be thus avoided. I am indebted to Dr. J. P. Greenhill for the following statistics:

We have done 67 low, cervical sections under local anæsthesia of which 39 were completed under novocain alone. In 19 we used a little nitrous oxide and oxygen, in 8 ethylene, and in 1 a little ether for the especially painful parts of the procedure; in 9 we had to go over to general anæsthesia in order to finish the operation. One of these patients was an eclamptic who began to vomit and extrude the intestines into the field. The others got too unruly. In 24 cases the women were in actual labor, and in most of these the pains were strong and at short intervals. In 2 patients we removed the tubes to effect sterilization.

The indications for these 67 cæsareans were:

Contracted pelvis with mechanical disproportion	37
Contracted pelvis with abnormality of mechanism	7
Placenta prævia	1
Abruptio placentæ	2
Eclampsia and threatened eclampsia (3 and 8)	11
Heart disease	4
Ovarian cyst complicating labor	3
Diabetes and contracted pelvis	1
Fracture of pelvis	1

There were no deaths in this series. One baby succumbed 6 hours after delivery; it was 4 weeks premature and the autopsy showed almost complete atelectasis pulmonum. One was dead and macerated—a case of chronic nephritis.

Of the 67 women only 10 (15 per cent) vomited after operation, and of these only one gave us any concern. With bowels moving and flatus passing, normal temperature and pulse, this patient had a great distention of her exceptionally thin but soft abdominal walls, and had stercoraceous vomiting. No cause was found for this condition. We did nothing but perform gastric lavage, which helped a little. The condition subsided in a few days. In the total of 338 cases of laparotrachelotomy, 26 per cent vomited, and the use of local anæsthesia has reduced this low figure still more.

There were 18 cases with postoperative temperature of 100.4 degrees or over (27.7 per cent), of which cases the temperature was 101 or over in 13. In the total series of 338 cases 40 per cent showed temperature of 100.4 at least once. Therefore it seems that local anæsthesia reduces the incidence of all factors making for a febrile recovery.

The causes of the fever were:

Bronchitis	2
Pyelitis (in 1 the condition existed before operation)	2
Lochiometria	2
Mastitis	1
Suppuration of the wound	4
Unknown	7

By coincidence, probably, the 4 cases of suppuration of the wound were patients who had had gas, ethylene, or ether.

One of the women with bronchitis had had ethylene gas, her wound suppurated and her baby also developed pulmonary complications. The other had had nitrous oxide and oxygen. None of the straight novocain cases developed bronchitis. One woman, not in this series, on whom Latzko's extraperitoneal operation was performed had bronchopneumonia at the time of operation. The wound suppurated but she recovered. The recovery of the patients was even better than the most sanguine surgeon could expect. It is a pleasure to see these women eat light diet within 24 hours after delivery, and a great satisfaction to know that the repair of the wound will not be interfered with by vomiting, retching, and coughing and by infection transported from the lungs.

While there is only 1 case on record[1] of fatal novocain poisoning it behooves us to be careful in using novocain. It should not be used in concentrations stronger than 1 per cent. We use it in concentrations of even less than 0.5 per cent. The amount of epinephrin should never exceed a total dosage of 1 milligram and if the patient has hyperthyroidism we use one-half of this amount.

[1] Mayer's Report of Committee on toxic effects following local anæsthetics. J. Am. M. Ass., March 15, 1924, 876.

SUMMARY

To sum up I would say:

1. Local anæsthesia is not only possible but should be the method of choice for all cæsareans, including the cervical.
2. The dangers of acidosis and pneumonia are avoided.
3. The postoperative recovery is smoother and quicker than that following general anæsthesia.
4. We are permitted through this added safety to extend the indications for abdominal delivery in borderline cases.
5. In heart, respiratory, kidney and liver cases it is particularly valuable, indeed almost indispensable.
6. If the surgeon will devote a little time to perfecting the technique he will be able to apply it in an increasing number of conditions with increasing benefit to his patients and satisfaction to himself.

PELVIC VARICOCELE

Diagnosis and Treatment, and a New Operation for Its Radical Cure

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THE history of pelvic varicocele is very meager indeed, because the lesion has been overlooked or barely mentioned by most authors of gynecology. All authors use the same words and bibliographical references, and, in the classical books, the subject is confined to a short unimportant chapter. Under symptomatology and diagnosis, if the subject is mentioned at all, we find only the veins of the broad ligament described with the statement that they could present varicosities.

Richet, in 1854, in his treatise on medical and surgical anatomy, was the first to describe the anatomy of these veins. He made both anatomical and clinical studies. As he found pelvic varicocele in autopsies he thought of it in the case of a patient who suffered during menses. In this case a tumor could be palpated on either side of the uterus. This tumor disappeared when the patient was in the horizontal position. Refrigerants were used as treatment. Devalz, inspired by Richet's thesis of 1858, found in 12 autopsies, made in the amphitheater of Clamart, three women with dilatation of the utero-ovarian plexus. One case, dissected by Parmentier, served Devalz as a model.

Devalz, following Richet, maintained that one of the most frequent causes of retro-uterine hæmatocele was the rupture of varicose veins. In his thesis on the varices of the pregnant woman, Budin (1875) dedicates only a few lines to pelvic varicocele without mentioning any new fact.

De Sinety studied the pathological anatomy. But it is in the American school, the cradle of gynecology, that pelvic varicocele is studied in a clinical sense and discussed from various angles. There exists an abundant literature.

Brinton, of Philadelphia, explains the pathogenesis of varicocele of the left side, describing a valve in the utero-ovarian vein and the right spermic vein at the point where they reach the cava, showing that this valve does not exist on the left side. In 1886, Lawson Tait finds in the third edition of Gray's *Anatomy* that there is plainly established the existence of valves in the spermatic veins.

In 1888 Dudley[1] published an important study of the influence of varicocele upon the ovary based on 4 cases treated with laparotomy. Porter made a microscopical investigation of the ovary and the veins from one of Dudley's cases, and this was the first histological study on pelvic varicocele.

In 1889, Coe spoke on this subject at a meeting of the New York Obstetrical Society. Corzette in his thesis (1889) discussed the influence of tumors of the uterus and the broad ligament, the obstacle they formed to the venous circulation, and the changes thus produced in the ovary.

Rollin and Fowler (1889) reported cases of rupture of the varicose veins of the plexus pampiniformis. In 1891, Paul Petit presented to the Société d'obstétrique et de gynécologie de Paris, a case of pelvic varicocele, operated upon by Pozzi, found in a laparotomy for sclerotic uterus; and gave an anatomical and histological study of the ovary and varices. This was his first paper and served as a basis for compilation of new observations describing the lesions of the ovary caused by pelvic varicocele.

Furthermore, there is an article from Herbert read before the Société anatomique de Paris, December 18, 1896, in which he showed a specimen of an enormous pelvic varicocele taken at autopsy and made a brief study of it.

J. Rousseau presents in his thesis (1892) some observations which may serve for study of pelvic varicocele.

[1] Varicocele in the female. New York M. J., 1888, April.

Isolated cases are reported by Hirst (1890), Baldy (1896), Hermann (1908), Cramer (1910), Dillel (1913), Malius, and Fowler. In the same journal, Alvarado Wall (1916) speaks of 3 or 4 cases, giving a brief study of diagnosis and treatment. Sensert describes a procedure for the radical cure of pelvic varicocele, modifying Reed's technique (Althon, *Practice of Gynecology*, 1915, p. 562). But none of those authors gives varicocele a chapter apart as it deserves.

I began to study pelvic varicocele for the first time in 1913 in the gynecological hospital of my beloved master, Professor Bazterrica. I saw the lesions which he presented, and noted the symptoms of the patients who formerly had been regarded as hysterical and who had passed through various hospitals to claim alleviation; but gynecologists had not been able to find any visible lesions corresponding to the marked subjective symptoms described by the patients. To all this my attention was turned and on the ground of my observations, made during 7 years in a great number of cases, I can assure you that pelvic varicocele is a most troublesome disease, presenting in the patient numerous marked subjective symptoms, but very few objective ones.

In 1915, I published in the *Anales del Servicio de Ginecologia* my first studies on this subject, the cases having been observed at the Clinical School of Professor Bazterrica who had the honor of making the first complete report on the diagnosis and radical treatment of pelvic varicocele.

The results of our first operations were published in Albina's thesis which represented my studies on tumors of the broad ligament. In 1916, I presented to the Faculty of Medicine, as a thesis of aggregation, a monograph on the subject describing the symptoms, treatment, and etiopathogenesis of pelvic varicocele. In my book on therapeutic and clinical gynecology issued in 1918, there is a whole chapter dedicated to this point.

In view of the limited space allotted me, I cannot give here a detailed anatomical description of the veins of the broad ligament, neither can I present a study of its etiopathogenesis and pathological anatomy as illustrated in my paper on pelvic varicocele. I want only to transmit to the readers of this review the new ideas which we have formed as to the pathogenesis, their application to the treatment, and the new operative procedure published here for the first time.

All our patients who suffered from pelvic varicocele were syphilitic. The syphilis in most of the cases was acquired or late hereditary in type. All cases gave a Wassermann frankly positive with high lymphocytosis—over 40 per cent. They all presented congestion. These cases seemed to have escaped observation although Aran and Courty mentioned them. These gynecologists regarded the condition as a morbid entity of great importance and the cause of a large percentage of the genital diseases of the female, calling it uterine congestion, and going so far as to exaggerate its importance. When the bacilli were discovered, the congestion was totally neglected, all types of congestion being regarded as syphilitic and treated as metritis. It cannot be denied that there is a congestive condition in the female pelvis, well described by Richelot, which forms the beginning of the pathological history of pelvic varicocele; this congestion makes its appearance during puberty, with such well marked clinical symptoms that Richelot thought it the first stage of sclerosis. This type leads to a state of diffuse sclerosis or, in some cases, to tumors of the uterus.

But it does not suffice to speak of a tendency to congestion. Analyzing the living conditions of our patients we found that these girls had done too heavy work during puberty before the menses appeared. This was especially true of those who belonged to an inferior social class. These girls worked in factories and stood almost the whole time or else spent their nights sewing. In other social classes the girls did unsuitable school work, sitting in the school bench with their backs in a forced position without support of any kind, or studying piano 5 or 6 hours a day, the mother not realizing that her daughter might be in the epoch of menses or near to it. Still others were compelled to do hard labor, without adequate alimentation or proper habits. From early life they were carnivorous, did not care for

their intestines, and were always constipated; and with these predisposing conditions, a lot of causes were summed up which all conduced to congestion.

But a simple predisposition to congestion will not cause the condition. There must be other grounds, and in this case the other factor is syphilis. The clinical features of syphilis are clearly obvious. It is the cause of congestive predisposition, it conduces later on to the sclerosis of the uterus, and accompanies the congestive state. I showed these facts in my paper published this year on the new conception and etiology of fibroid degenerations of the uterus. In this I stated that the only cause of fibromyoma of the uterus is the syphilis itself and that we should consider it as a syphilitic tumor. This congestive condition, found in varicocele, is accompanied by changes in all the glands of internal secretion, and we know that no infection could affect the secretory function more than syphilis. Hyperthyroidism or hypothyroidism is not always found, but there may be a dysendocrinia. Those changes are the result of a general infection, which may be acute rheumatism, influenza, tuberculosis, etc., but is usually hereditary or acquired syphilis.

Accordingly, I consider syphilis to be the cause of the congested pelvic condition, the internal glandular changes being secondary to it.

In order that a congestive condition may develop into pelvic varicocele there must be an alteration of the venous walls. The congestive condition begins as a result of the syphilis and, on the other hand, of infections which affect directly the pelvic venous walls, such as puerperal fever, which produces phlebitis. But these are not the only causes, because pelvic varicocele is found in a number of cases in which the female is sterile or never has suffered a genital infection. The specific poison itself is the cause of venous as well as of arterial dystrophy; and in the same way as general artheromatosis of the arterial system arises so artheromatosis, or better, sclerosis of the venous system is produced.

The venous genital apparatus of the female is formed principally by the utero-ovarian veins, which accompany the utero-ovarian arteries and again collect the venous circulation of the uterus, oviducts, and ovaries; they start at the broad ligament, forming an intricate plexus called the mesosalpinx, and a net of veins extending over the entire broad ligament. The veins which rise from the uterine walls in the so-called uterine lakes meet in two big collaterals, which pass through the sides of the uterus, form themselves into vesical, vaginal, and hæmorrhoidal veins, and take up the whole circulation of the pelvis. They form three trunks, the utero-ovarian and the uterine, the one being anterior and the other posterior. The utero-ovarian veins discharge in the following way: the right vein into the lower vena cava, the left one into the renal vein, forming an acute angle without valves; the other uterine collectors, together with the vesical and vaginal collectors, etc., form afterward the renal, hypogastric trunk, discharging into the internal iliac vein.

In almost all of our cases we found two utero-ovarian veins on each side, rising from the iliac-ovarian ligament, and just these we have to take into account for our operative procedure. The characteristic feature of varicocele is the lesion of the venous wall, extending over the three layers of the vein which is filled with sclerotic tissue from the endo-vein up to the middle part. This sclerotic tissue encircles the vein and produces a sort of periphlebitis which involves the adjacent nerves, and here we have the explanation of the pains, the neuritis of varicocele. Therefore, the aches and pains are the first symptoms to be observed in these patients.

Varicocele has symptoms which must not be confounded with other conditions. First, there are few objective or physical symptoms; whereas the subjective ones are abundant. The patients, in excellent general condition, complain continually of pains in the vagina, of vesical and rectal tenesmus especially, of heaviness in the lower belly, and of pains 2 to 3 days before the menses with alleviation the moment the monthly courses begin.

Another marked symptom, which only I have described, is the dyspareunia or pains during coition which I call "erotic pains"; consequently the pelvic congestion of the plexuses adjacent to the clitoris causes those

patients to feel a permanent voluptuous sensation at the least excitation, which they cannot satisfy because of the intense pain which coition causes. These pains can be produced by gently compressing the vaginal walls above the levator ani and then the blind sacs. The patient feels a violent pain and voluptuous sensation at the same time. This symptom never has been described, nevertheless I found it in all patients suffering from pelvic varicocele.

Another symptom is the abundant leucorrhœa of the hydrorrhœa type, due to the excessive secretion of the glands.

There are, therefore, four principal symptoms of varicocele: dyspareunia, erotic pain, dysmenorrhœa, and leucorrhœa of the hydrorrhœa type; sometimes there are also abundant monthly courses of the menorrhagic type with the reflective symptoms already mentioned, such as vesical and rectal tenesmus.

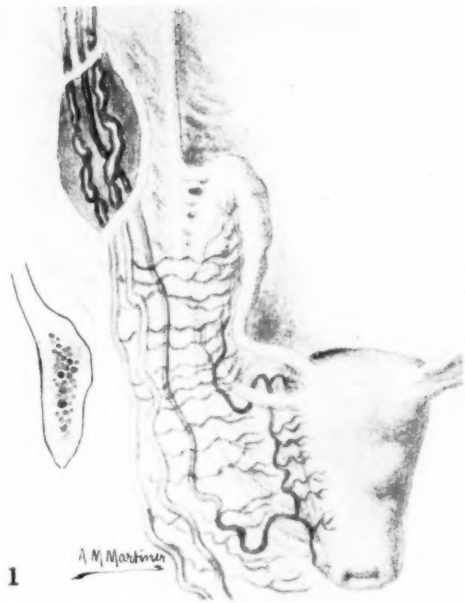
The physical symptoms which establish the diagnosis are local and general. Among the latter there is the congestive, hypothyroid type, the signs of which have been well described by Hertoghe and Levi, and Rothschild—the superficial and profound varices in the lower limbs. Sometimes there are signs of hyperovarianism and hypothyroidism, local, excessivly painful rugosities on the bottom of the vaginal sac, especially in the cul-de-sac of Douglas; and hot, turgid, œdematous, and congested vaginal walls.

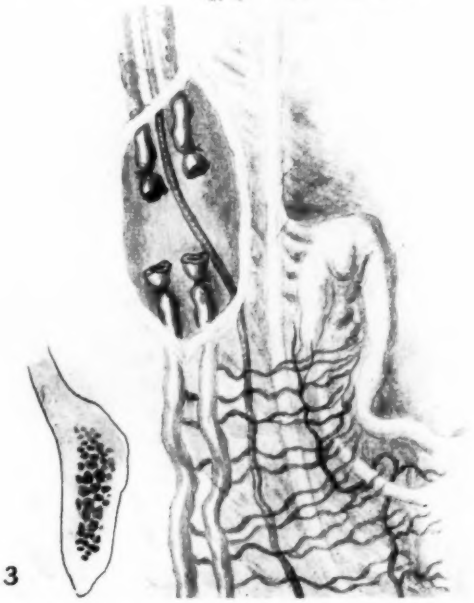
The varicose piles are made visible by having the patient assume the standing position or by lifting the thorax; afterward they can be made to disappear in the Trendelenburg position. It was I who conceived this method of discovering the varicosities, a method which never fails. Therefore, when the patient is in the Trendelenburg position for laparotomy, the diagnosed varicocele cannot be seen but by compressing the uterus with the hand or depressor, the varicose piles may be seen to fill and stand well out from the broad ligaments.

The adnexal inflammations and prolapsed sclerocystic ovary are differentiated from varicocele by the fact that they are accessible to palpation like tumors and are generally double; they never cause the characteristic pain of varicocele which appear hardly touching the bottom of the vaginal sacs. When these conditions are associated with varicocele which has been established for some time, we find a big sclerotic uterus, with the tendency to fall in retroflection, big, œdematous ovaries, showing the lesions described by Petit as pseudocysts and different from the real sclerocystic ovaries. It is necessary to submit these patients to early treatment to avoid the possibility of these lesions attacking the uterus and ovaries, as this would necessitate radical treatment such as hysterotomy. These patients usually already have become neuropathic because of the continual pain and the failure of all treatments tried.

The cure of pelvic varicocele is essentially surgical; none of the anticongestive medical treatments serving as a cure. As coadjuvants, not as remedies, it is well to use anticongestive diet, care of the intestines, specific medical treatment; mercurial, arsenical, and iodine cures; opotherapy to overcome hypothyroidism and the different endocrine alterations which prevail in each patient. Excitation and congestion should be avoided. The surgical treatment is to be made as early as possible, methods being employed which permit the conservation of all organs in perfect state.

To date we have eliminated two conserving operative methods, those of Keed and of Sensert. Keed's procedure consists in dissecting the varicose piles of the mesosalpinx. He makes separate ligatures, underbinding the piles in different sections and cutting them, between but without extirpating them. In the first stage of the operation of Sensert, the broad ligament is extended, the oviduct is pulled upward and forward, and the uterus is moved forward so that the varicose piles from behind in the broad ligament may be seen. In the second stage the broad ligament is opened so that its posterior sheet or the anterior one is brought forward by means of a transverse incision from below the fallopian tube; he dissects carefully the varicose piles using a grooved probe, and fixes ligatures on both ends of the piles near the uterus and the most external part of the broad ligament. In the third stage he dissects and extirpates the varicose piles between the ligatures, keeping the catgut





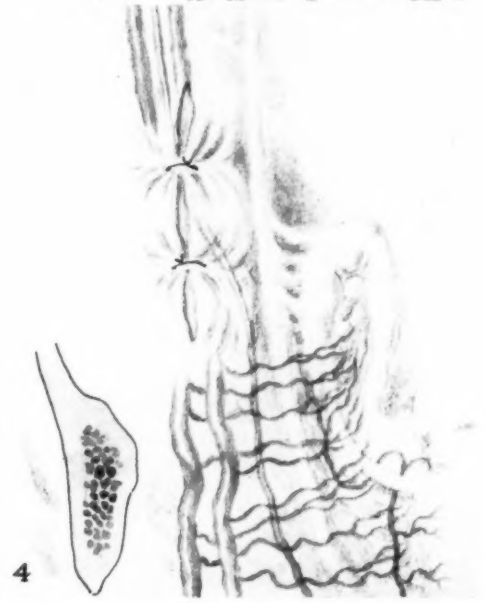


Fig. 1. Showing the arteriovenous piles and the utero-ovarian venous trunk.
Fig. 2. The veins are lifted with a probe.
Fig. 3. The vein is cut between the ligatures.
Fig. 4. The same procedure is performed on the opposite side.

threads pretty large at both ends. In the fourth stage he joins both dissected ends and ties the threads of both ligatures making a suture in each pile separately; in this way he folds and wrinkles the broad ligament which becomes distended. In the fifth stage he sutures with continuous fine catgut the opened sheet of the broad ligament. This operation is performed on both sides of the uterus.

The methods of Keed and Sensert are incomplete, because only a part of the varices of the broad ligament are suppressed. Furthermore, they are difficult and require the greatest care. Even then it is not easy to conserve the integrity of the broad ligament, to avoid injuring the arteries and suppressing the irrigation of the oviduct with the ligatures in cases of hæmorrhages, when the varicose piles are being treated. And finally, the most important objection I make, is, that they do not overcome the mechanical cause of varicocele, which must be done if this disease is to be cured in man.

Richet made a series of postmortem experiments in which he compressed strongly the thorax at its base. He observed that the veins of the broad ligament filled; indeed, the compression above the vena cava inferioris makes a big venous column fall toward the pelvis, filling the veins of the broad ligament; this reflux of blood can also be observed in man and is perfectly explained as already mentioned, by the absolute lack of left side valves and the complete insufficiency of those of the right side. Thus, the blood column of reflux or retrocession becomes a permanent burden for the pelvic veins which they cannot avoid because of the working position of the patient, etc. In addition to this there is the factor, "predisposition," and the bad condition of the distended venous walls. The Trendelenburg position empties the pelvic veins, the inverse position fills them—another result of Richet's experiments.

On the basis of these experiments a companion of ours, Dr. Ivanissevich from the Hospital de Clinicas, one of Professor Arce's assistants, contrived a method for curing scrotal varicocele. He observed when dissecting the spermatic vein that blood flowed back from the upper and not from the dissected lower one; therefore he tied the spermatic vein from above and outside the external inguinal ring, and removed the thread from there. He thus cures varicocele by means of a simple, easy, and practical method which suppresses the refluent blood column and burdens the venous testicular system. Up to date he has operated upon more than 20 cases of scrotal varicocele with excellent results.

Based upon Ivanissevich's method for the male we established a technique for the cure of pelvic varicocele, detailed as follows:

We perform a small laparotomy, subumbilical, in the midline which gives easy access to both ilio-ovarian ligaments; then we go on to discover the varix, compressing for that purpose the uterus with the hands or with a hysterolab in order to fill the varicose piles and make them visible, and to corroborate thus their presence, already clinically diagnosed. Then the compression of the uterus is suspended and we look for the ilio-ovarian ligament, first on one side and then on the other, dissecting with the lancet the peritoneal sheet; immediately there appear the arteriovenous piles and the utero-ovarian venous trunk. Generally, this trunk is double. We found it in our cases as illustrated in Figure 1. With a grooved probe the veins are dissected carefully for a distance of approximately 2 centimeters and lifted with the probe or with a thread-holder (Fig. 2). Now, ligatures of catgut are fixed at the dissected upper and lower ends of the vein (in both veins separately), and the vein is cut between them (Fig. 3). Finally we put two stitches of fine catgut in the opened peritoneal sheet of the ilio-ovarian ligament. The same procedure is repeated on the opposite side (Fig. 4).

All this is performed quickly, without any difficulties; the venous blood column becomes suppressed, flows back from the upper end of the dissected vein, and forms a permanent burden to the venous system of the broad ligament.

CONCLUSIONS

From the results I have obtained, the following conclusions can be drawn:

1. Pelvic varicocele constitutes a clinical and anatomical entity of gynecology and

should occupy a separate chapter of this specialty.

2. Pelvic varicocele is rather frequent. If it is kept in mind and the subjective and objective signs of its symptomatology are known, it is easily diagnosed.

3. Pelvic varicocele presents proper symptoms, not yet differentiated, which distinguish it from sclerocystic ovaritis, from simple uterine congestion, from utero-adnexal inflammation, and from parametritis.

4. Pelvic varicocele is that disease in gynecology which presents the most subjective and the fewest objective symptoms.

5. An early diagnosis is of great importance as surgical treatment of conservative nature should be initiated before uterine and ovarian lesions are produced.

6. The procedure we have contrived which I shall call the "Argentine method," is both easy and simple and overcomes the mechanical cause of varicocele.

FIBROID TUMORS OF THE VULVA

With Report of an Unusual Case

By WILLIAM D. FULLERTON, M.D., F.A.C.S., Cleveland, Ohio

FIBROID tumors of the vulva are uncommon. They are, however, the most frequently observed benign solid tumors of this region. Leonard (2) found but six cases in 23,000 gynecological admissions to the Johns Hopkins Hospital, Baltimore, and during the past 25 years from 12,000 admissions on a similar service at Lakeside Hospital, Cleveland, only 2 cases were found.

The tumors occur almost invariably during the childbearing period (4) although they do occur later and have been observed in infants (1). Virgins and parous women seem to be about equally affected.

These tumors are usually single. They are first seen as small, firm, rounded and smooth or slightly lobulated, painless subcutaneous masses. The smaller ones, especially if deep, may easily be overlooked. Pedunculation is common, particularly in the larger tumors. Growth may be rapid, although it is more often slow. Interference with locomotion or discomfort from position send the woman to the surgeon. The skin over the tumor is wrinkled, often more or less pigmented, and freely movable. Because of the increased vascularity of the parts during menstruation and pregnancy, swelling and more rapid growth are often noticed at these times. Ulceration is rare although such a complication occurs from interference with the blood supply or external irritation. Degeneration and malignant transformation are more common in these tumors in this location than in similar tumors elsewhere on the body, probably because of their variable blood supply, pedunculation, and position, which makes trauma more or less unavoidable. Œdema, hyaline and cystic degeneration, calcification, ulceration, infection, and sarcomatous transformation have all been observed in these tumors. They originate in the connective tissue and may start anywhere in the vulvar structures or in the extraperitoneal portion of the round ligament or internal genitalia and as they increase in size, they are forced into the line of least resistance down the inguinal canal or vagina and appear at the vulva.

Leonard's (2) painstaking, well written and well illustrated paper should be seen by everyone interested in the subject. He classified vulvar tumors as follows, and records the number of cases in each group as reported in the literature.

Group 1 consisted of 70 cases of fibroid tumors originating in the subcutaneous connective tissue: (a) of the labium majus (53 cases), (b) of the labium minus (11 cases), (c) of the vestibule and vagina (5 cases), and (d) of the perineum (1 case).

Group 2 consisted of 39 cases of fibroid tumors originating in the extraperitoneal portion of the round ligament and: (a) growing outward into the labium majus (25 cases), (b) remaining in the inguinal canal (11 cases), (c) growing back into the abdomen (2 cases), and (d) growing up between the layers of the abdominal wall (1 case).

Group 3 consisted of 14 cases of fibroid tumors originating in the subperitoneal connective tissue and appearing at the vulva.

Group 4. There were 4 cases of fibroid tumors originating in the connective tissue of Bartholin's gland.

Group 5 consisted of 2 cases of fibroid tumors originating in hæmatomata.

Group 6 consisted of 2 cases of fibroid tumors originating in the connective tissue of the rectovaginal septum.

The case which I have to report falls into the first group, Class c, in which the tumors originate in the subcutaneous tissue of the vestibule. This type of case is represented in the 131 cases collected by Leonard by a single instance, that of a case reported by Parsons (3). Parsons' patient was a woman of 30, showing a firm walnut sized tumor of the vestibule, projecting forward and pushing the urethra downward. This tumor proved to

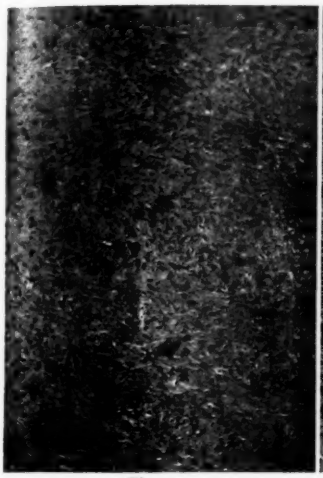


Fig. 1.

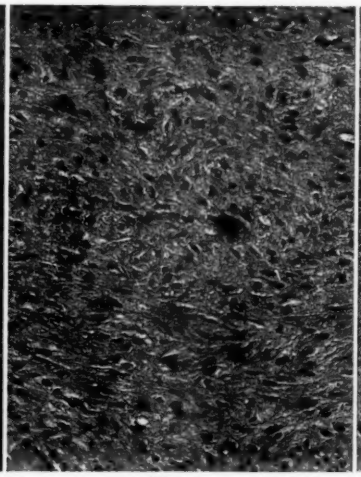


Fig. 2.

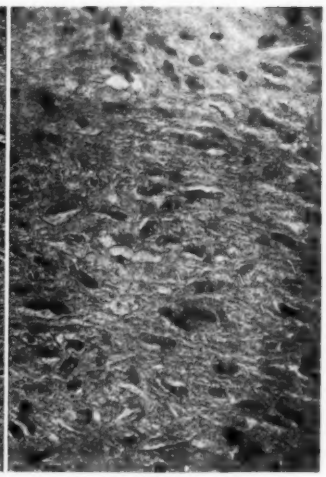


Fig. 3.

Fig. 1. The cellular nature of the connective tissue is easily seen. There is less whorl formation of the connective tissue than in the usual uterine fibroid. The nuclei are evenly distributed and mostly equal in size and regular in outline. ×100.

Fig. 2. Here is seen the rather loose packing of the connective tissue cells. Many of the nuclei are seen in cross section, appearing circular or oval in outline. Shrinkage and absorption of all or part of some of the nuclei accounts for the vacuolated appearance of the tissue. ×215.

Fig. 3. Here the vacuolation and loose reticular structure of the stroma is readily seen. The nuclei are evenly stained and mostly regular in outline. No mitosis or dividing cells are seen. ×400.

be a fibromyoma, showing hyaline degeneration and calcified nodules. Unfortunately for the sake of comparison with my case, there is no detailed history, pathology, or illustration.

The following case presents some interesting points for diagnosis.

The patient, Gynecology No. 77750, a married nulliparous negress, 24 years old, was admitted to Lakeside Hospital, May 13, 1920, complaining of irregular vaginal bleeding for the past 4 years, tumor in vagina, dysuria, pain in the lower abdomen, and leucorrhœa.

The family history was negative.

The past history was negative, except that her periods began at the age of sixteen, were regular every 4 weeks, lasted 6 days, and were free in amount with no pain. There was no history obtainable of venereal infection.

Present illness. About 4 years ago she noticed a slight swelling just above the external urethral orifice. This has greatly increased in size. Since she first noticed the tumor, she has had irregular vaginal bleeding, never profuse and usually only slight in amount. This bleeding has continued for a few days and then stopped for a day or so but has been more or less constantly intermittent for the past 4 years. Since her marriage one year ago, she has had moderate leucorrhœa and some slight discomfort on voiding, which act has been somewhat increased in frequency, she getting up two or three times at night. There has been no difficulty in starting to void nor obstruction to the passage of the urine. For the past year she has had backache and more or less constant though not severe pain in her lower abdomen. Both of these symptoms are increased on exertion.

Physical examination was negative, except for the genitalia. The vulva (Figure 1), presents the following findings. The labia are normal. Immediately beneath the normal clitoris a rather soft tumor mass completely fills the vestibule and bulges forward depressing the urethra backward and downward into the vagina so that the external meatus is almost invisible. The mucosa over the tumor is moderately congested, fairly freely movable and nowhere shows ulceration. The tumor mass is about 3 centimeters in diameter, circular in outline and extends well up under the lower edge of the symphysis. It is rather soft and gives the impression on palpation of being slightly lobulated. It is fairly well fixed and permits of but little motility. There is considerable purulent leucorrhœa. The external meatus of the urethra is dilated and intensely congested, with areas of broken mucosa and ulceration. Gonococci were found in numbers in the pus expressed from the urethra. Bartholin's glands appeared uninvolved. There was no hypertrophy or tenderness of the inguinal glands. The vaginal orifice was slightly reddened, and the perineum in good condition; the normal vagina contained con-

Fig. 4. Drawing showing condition before operation. The major and minor labia are normal, also the clitoris. The minor labia are spread apart, the tumor bulging forward and downward immediately beneath the clitoris. The urethra is depressed downward and backward into the vagina and is just visible. The tumor mass extends well up under the lower edge of the symphysis and is but very slightly movable.

siderable purulent discharge. The cervix was moderately enlarged and lay in the vaginal axis. The fundus was normal in size, retroflexed and adherent in the pelvis. The tubes were thickened and adherent. The left ovary was cystic, 6 to 8 centimeters in diameter, and adherent. The temperature was 99, pulse 85, respirations 20, blood pressure 120–80, hæmaglobin 90 per cent, white blood count 12,800. The Wassermann was negative. Voided urine was negative except for a few white blood cells and epithelial cells. The question of diagnosis involved differentiating a benign from a malignant growth and determining whether the tumor was solid or cystic. The fact that the condition had been present 4 years, and the absence of glandular involvement and ulceration without more definite fixation were in favor of its being benign. If malignant, it was probably squamous in type and from the urethra. The various glands in the vicinity were not involved in this case, nor, as one would expect if it were malignant, was there any involvement of the urethra or definite obstruction to the outflow.

Periurethral abscess or a cyst of Skeen's duct were other possibilities, especially when active gonorrhœa was present. An endoscopic examination of the urethra showed this passage to be only slightly inflamed without any obstruction or sinus connecting it with the mass. A diagnosis was made of benign solid tumor of the vestibule, probably fibroma.

First operation. Under nitrous oxide and oxygen anæsthesia, a vertical incision was made from the clitoris to the external meatus. The tumor mass was well encapsulated, slightly lobulated, and surrounded the urethra except on the posterior or vaginal surface, though it did not cause any obstruction. The tumor with the surrounding parts was rather vascular. It was shelled out, some difficulty being experienced in freeing it up under the symphysis where it lay in the anterior urethrovesical crotch. The cavity and mucosa were closed with chromic catgut and a cigarette drain left in the lower angle.

Pathology. The specimen measured 3.5 by 4 by 3 centimeters. It was soft, slightly lobulated, and encapsulated. On section there was marked lobulation. The tissue was fibrous, with some cellular elements which were lost on scraping. Some small, grayish-yellow areas were seen, probably of early degeneration. On microscopic section (Figures 1, 2, and 3) the tumor was found to consist mainly of very cellular fibrous connective tissue; no smooth muscle was seen. The fibril production was relatively small. Most of the nuclei were oval or spindle-shaped, but here and there a large round nucleus was seen. The nuclei stained uniformly. There were no mitotic figures and only moderate vascularity. In some areas there was great density of the fibrous tissue. There was no combing of the cells away from the blood vessels. Here and there were vacuolated areas caused by the degeneration and absorption of nuclei.

Diagnosis. Cellular fibroma of the vestibule.

Subsequent history. After removal of this tumor the patient had no difficulty in voiding or other complication. Her temperature was never above 99 and the vulvar wound healed satisfactorily.

Three days after the first operation the patient's abdomen was opened for a chronic pelvic peritonitis. Both tubes and left ovary as well as a badly adherent appendix were removed and the uterus suspended. Since this second operation was not unusual and had no bearing on the vulvar tumor, the details will be omitted. The patient left the hospital in 2 weeks after an uneventful recovery and has since been perfectly well for more than one year, there being only a linear scar from the clitoris to meatus and no other sign or symptom of her former trouble.

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ACUTE LOCALIZED INFECTION OF THE KIDNEY

By ARTHUR E. HERTZLER, M.D., F.A.C.S., Halstead, Kansas

SEVERAL writers have complained that the literature on acute infections of the kidney is confused. A perusal of this literature has convinced me that this difficulty is in part due to the fact that many of the writers treat the subject as an abstract proposition rather than as a concrete consideration of the patients and the pathological material which they have yielded. This paper is based largely on material from the clinic and laboratory. The study has been possible because during the past 15 years many of my friends have been liberal in placing pathological material and clinical charts at my disposal. This is supplemented by a considerable amount of material of my own.

CLASSIFICATION

From this study I am attempting a classification which I believe will be useful to the surgeon and which is substantiated in a large part by the data gained from the study of the pathology.

In attempting a classification of clinical utility it is necessary to consider the local pathological process, the antecedent lesions, and the subsequent course, keeping past experiences in mind. On this basis we arrive at a classification something as follows:

1. *Acute hæmatogenous infections.* In this type bacteria floating in the blood stream lodge in the kidney. In some of these there is no obvious source of infection of surgical magnitude and we must look to the discovery of more obscure foci. In others, there is a preceding gross lesion.

2. *Pyelonephritis.* In this type both the kidney and its pelvis are involved. Accumulating evidence suggests that the acute infections arise primarily in the kidney and the symptoms are due to the kidney lesion, and that in those cases in which there are lesions in the pelvis of the kidney they are secondary and subsidiary.

3. *Ascending infections.* In this type, the infection is supposed to ascend up the ureter. There are lesions in the lower genito-urinary tract, and the presumption that the infection travels up the ureters to the kidney has not been substantiated by laboratory evidence.

It is generally accepted that kidney infections may occur through one of three paths: through the blood stream, through ascending the ureters from some preexisting infection in the lower urinary tract, or by a retrograde process by way of the lymphatic route.

HÆMATOGENOUS INFECTIONS

In favor of the hæmatogenous route may be noted the following evidence. It has been demonstrated that bacteria circulating in the blood stream escape through the kidneys. In generalized pyæmias in which bacteria can be demonstrated in the blood stream, there are frequently multiple abscesses in the kidney along with similar infections of other parenchymatous organs, joints, etc. The same organism floating in the blood can be found in these various secondary foci including those found in the kidney. Bacteria injected into the blood stream frequently produce foci of infection in the kidney. Known abscesses elsewhere (boils and carbuncles) may be associated with kidney infection showing the same bacteria as the surface lesion. The location of the lesions in the kidney is identical with that of inert particles injected in the blood stream.

Infections of the kidney are observed in the absence of any involvement of the lower urinary tract. An ascending infection cannot be hypothecated in the absence of infection of the lower urinary tract. In those cases of acute kidney infection following bladder instrumentation or urethral catheterization it must be assumed that the infection reaches the kidney by way of the blood stream when no local reaction at the site of instrumentation follows.

ASCENDING INFECTION

That infection may travel along the ureters and reach the kidney has long been assumed

and possibly does occur but certainly much less frequently than was formerly believed. The chief argument in favor of this belief is that the same type of infection occurs in the kidney that is found in the lower urinary tract. When the kidney is affected primarily the lower urinary tract does not become involved. Most observers admit that the necessary antecedents are some obstruction at the outlet of the bladder, retention and infection of the urine, and a disturbance of function of the urethral sphincter.

This does not prove that the infection ascends along the ureter. The bacteria of the lower genito-urinary region may just as easily be conceived as entering the blood stream at the point of primary involvement and then reaching the kidney through the circulation. Trauma of the lower urinary system is often followed by involvement of the kidney without a local lesion. A still more impressive fact is found in the location of the lesions. In the so-called ascending infections the lesions are located as they are in hæmatogenous infections while if the infection were really ascending one should find the greater number of lesions in the pyramids.

The greatest argument in favor of this type of infection is found in the clinical course.

This type has a symptomatology all its own, in no wise resembling the clinical course of the frank hæmatogenous infections. However, this difference may be found in the type and virulence of the infecting organisms, the antecedent state of the kidney, the physical resistance of the patient and the rapidity of onset.

Lymphogenic infections. The lymphatic route requires consideration chiefly out of respect to the eminent authorities who have suggested it. That there are lymphatics about the ureters goes without saying. Also, there may be retrograde transplantation to the kidney as Eisendrath believes is possible. In favor of this theory can be adduced only the argument that there is a periurethritis in some cases of violent cystitis followed later by kidney infection. However, this periurethritis has never been traced as far as the kidney. It has been repeatedly stated that the lymph plexus surrounding the ureter is made up of three segments representing different portions of the ureters, each draining in a different direction. If these observations are correct, for infection to travel from the bladder to the kidney by way of the lymphatics the bacteria would need to travel not only against the natural lymph current but also from one segment of lymphatics to another in two places. A study of pathology in no way substantiates this theory. The associated pyelitis in kidney infections is most intense at the kidney border and ceases at the upper ureter. The task is set for those who advocate this route to show a continuous involvement of the periurethral lymphatics.

PATHOLOGY

The study of pathology begins when the lesion first becomes accessible to sight or touch and ends only when the last cell has been identified. This study may be divided into several phases; the lesion as it appears in the body, the gross appearance in the laboratory, and the histopathology. To the surgeon the greatest interest has to do with the appearance of the lesion at the time it is producing the symptoms for the relief of which his services are demanded. It is necessary, therefore, to discuss the appearance of the kidneys as the surgeon first sees them. The form and structure of the various types of lesions is more striking when the kidney is observed *in situ* during the course of an operation than after it is removed and particularly after it has been hardened in formalin. In material obtained at autopsy it is necessary to consider if the kidney was the sole or only a contributing cause of death. Histological study is interpretative. Without it we can only speculate as to the nature of the gross lesion.

Hæmatogenous infection. When exposed during operation the kidney is intensely bluish red and may be double the normal size or even larger. It is soft to the touch with areas of firmer tissue. After the hyperacute stage is past the harder areas may be seen to be elevated above the surrounding area of the kidney, they are of a lighter red or even grayish red color, and the kidney becomes smaller and firmer. In the laboratory specimen the nodules

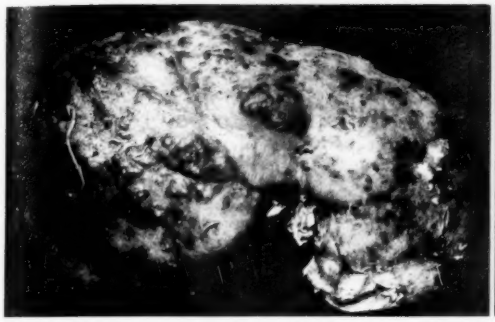

Fig. 1. Acute hæmatogenous infection of the kidney following ureteral catheterization. Note the dark hæmorrhagic nodules and the white infarcts.

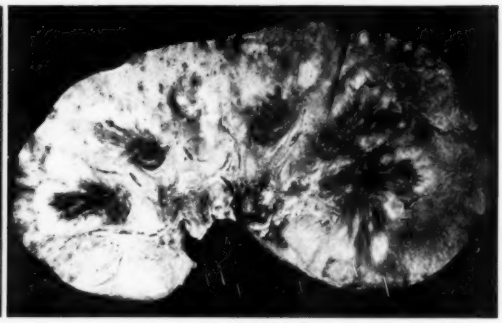

Fig. 2. Cross section of Figure 1 showing many small lesions in the cortex. Several of the apices of pyramids show hæmorrhagic infiltration.

protrude from the surface with the paler dehydrated tissue between. The nodules appear as blue black from the coagulated blood in the tissues (Fig. 1). On section these nodules are less conspicuous, appearing as dark areas when they are of recent growth, and lighter when they are older (Fig. 2). In older lesions after the extravasated blood in the lesions (so-called abscesses) is absorbed, the nodules protrude but show little difference in color (Fig. 3). On section after hardening the lesions show but slightly (Fig. 4). In some instances the surface shows few lesions (Fig. 5) while the pyramids show extensive involvement (Fig. 6). In most cases the pyramids show only partial involvement but in some the entire apex is involved in a hæmorrhagic infiltration (Fig. 7). In chronic cases the pyramids may show extensive lesions. In one instance (Fig. 8) the tubules were much dilated and contained many fine sand granules. One had a fine spicule of stone hanging from the apex of the pyramid like an icicle from a pump spout. The end stage is the formation of scars to replace the nodules. How long the hyperacute stage lasts is not known. From the material at hand I would make a tentative guess at 4 or 5 days but I have seen them still intensely engorged after 60 days.

The pelvis is empty and the mucosa shows a whitish glistening or a reddish appearance. The wall does not seem thickened to the palpating finger. I have never seen a pyelitis without associated kidney lesion except when there was a stone or tumor present.

On section the indurated nodules above noted are surrounded by an area of deeper red color. They are not abscesses.

My experience in the so-called ascending type has been confined to the autopsy table.

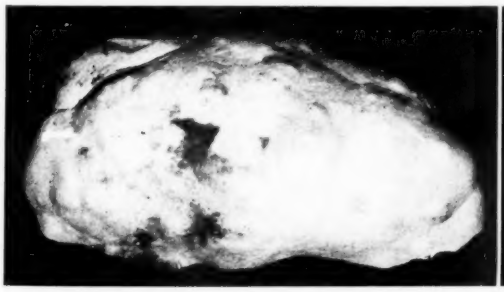

Fig. 3. Later stage of hæmorrhagic infection. The nodules have absorbed the extravasated blood and appear as infarcts.

Fig. 4. Section in hæmatogenous infection. Note the nodules in the apices of the pyramids. The pelvis is not affected.

Fig. 5. Cortical infarcts are scattered, a few showing in the upper pole.

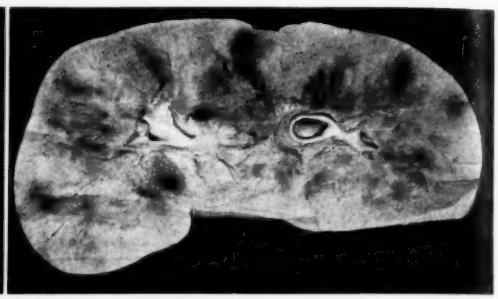

Fig. 6. Cross section of specimen in Figure 5 showing extensive involvement of the pyramids.

For this reason some allowance must be made but I believe it may be stated that the kidneys are smaller, firmer, and lighter in color. The lesions are less conspicuous, being generally more deeply seated. In some instances, however, the surface is covered with true abscesses (Fig. 9). Sometimes the abscesses are perirenal (Fig. 10) producing lesions between the kidney and its capsule. Usually in ascending infections the tiny abscesses are scattered throughout the kidney (Fig. 11) predominating, however, in the cortex. In this specimen the pelvis was not involved though the patient died of carcinoma of the prostate. On section the abscesses appear sharp-walled without a halo of induration about them (Fig. 11). The lesions are usually bilateral. In many the size of the kidney is smaller than normal and not infrequently the capsule is adherent whether there are peripheral abscesses or not.

HISTOLOGY

Unfortunately, pathologists have spoken of the lesions in infections indiscriminately as abscesses. To them an inflammatory process

Fig. 7. The pelvis is not involved but the apex of one pyramid shows an extensive hæmorrhagic infarct.

Fig. 8.

Fig. 8. Chronic lesion showing detailed tubules in the apices of the pyramids. Fine sand granules are seen in some of the tubules.

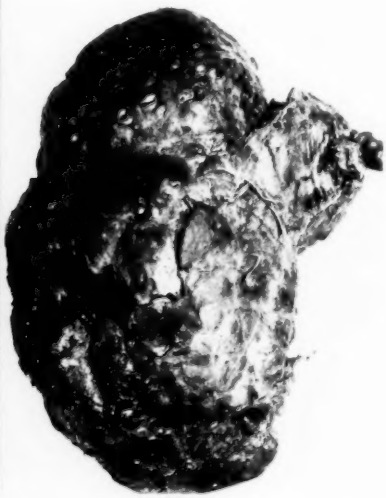

Fig. 9.

Fig. 9. So-called ascending infection of the kidney showing many true superficial abscesses. Patient died of prostatic obstruction.

Fig. 10. Specimen showing pe.irenal abscesses which have produced lesions between the kidney and its capsule. In this case the patient died from carcinoma of the prostate.

Fig. 11. Cross section of a kidney showing a large number of abscesses scattered throughout the kidney but more numerous in the cortex. The pelvis is not involved. The patient died from carcinoma of the prostate.

is an abscess whether it breaks down and forms pus or not. To the surgeon, however, an abscess is an area in which the defensive forces of the body have met defeat and must be gotten rid of by removal or drainage. In the kidney infections under consideration both conditions prevail; in one the defensive forces obliterate the lesion, in the other actual abscess formation takes place.

In the hæmatogenous type the nodules are seen to be made up of conglomerates of cell infiltration (Fig. 12). Early there may be polynuclear infiltration. In the early extensive cases there is extensive hæmorrhage into the affected area (Fig. 13). In some instances in the beginning, and in most later on, the infiltrated area is made up of round, endothelial, and plasma cells (Fig. 14). There is no liquefaction of tissue, and therefore no true abscess formation. As the condition progresses there is an increase in the periglomerular and interlobular connective tissue and along with this degeneration of the parenchymal epithelium. The parenchyma in the region occupied by the infarct is always destroyed and in many instances for considerable distances beyond.

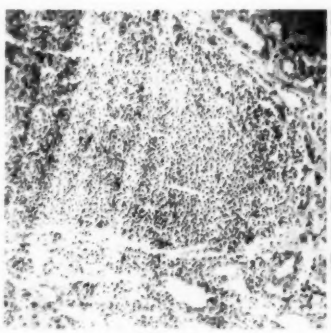

Fig. 12.

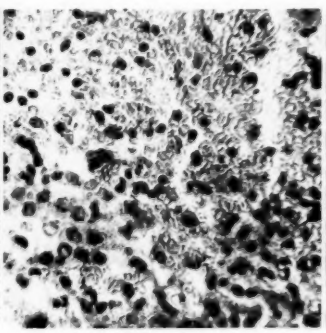

Fig. 13.

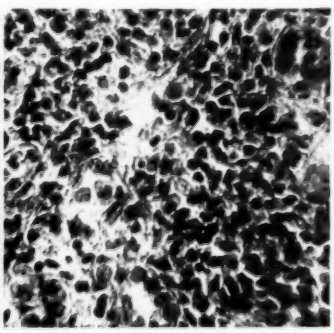

Fig. 14.

Fig. 12. This slide was made from a specimen of a nodule in an early acute hæmorrhagic infection. The conglomerate is made up of round cells and extravasated blood.

Fig. 13. Border of an infarct showing extravasation of blood.

Fig. 14. Slide from an old infarct showing round and endothelial cells.

Fig. 15.

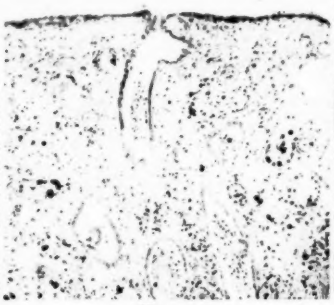

Fig. 16.

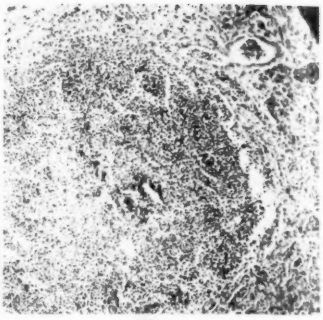

Fig. 17.

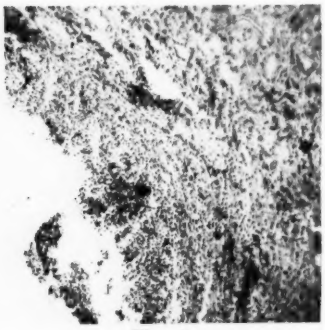

Fig. 18.

Fig. 15. Apex of a pyramid showing extensive infiltration about the tubules. The pelvic mucosa is not involved.

Fig. 16. The apex of the pyramid shows hæmorrhagic infiltration extending to the pelvic mucosa.

Fig. 17. Small encapsulated abscess made up of round and polynuclear cells with beginning liquefaction in the center.

Fig. 18. Wall of a small abscess showing the pyogenic membrane.

Because of this, when the lesions are numerous there remains little tissue which seems capable of restitution to normal.

These lesions are entirely comparable to the infarcts with which the internists are familiar, and like the infarcts familiar to internists those areas situated near the surface scarring in the capsule may cause a dimpling of the surface and an adhesion to the capsule.

These areas in spreading extend toward the tips of the pyramids. As they approach the surface they produce an extensive infiltration in the submucosa (Fig. 15). This infiltration in some instances can be followed over the entire extent of the pelvis producing a submucous infiltration. The surface epithelium of the pelvis is not destroyed but it may become infiltrated by the subepithelial cell mass. In some of the more violent cases there is extensive hæmorrhage into the apices of the pyramids (Fig. 16). It is these cases which show blood in the urine as an early symptom. There is no involvement of the pelvis unless the pyramids are involved.

There is a type of hæmatogenous infection secondary to definite infections, general sepsis, boils, carbuncles, etc. In these secondary infections the polynuclear infection is dense but with little round cell infiltration. If the patient dies early the changes do not go beyond this stage, otherwise the fibrous tissue loses its identity and the center liquifies and an abscess results. The renal epithelium usually shows cloudy swelling and may be cast off. Increase in fibrous tissue may be considerable especially in long-standing cases. The lesions finally may heal with a dimpling scar. The course of these can be predicted from a knowledge of the character of the primary lesion.

In the so-called ascending type the lesions are definite abscesses in most cases. Early lesions present areas of cell infiltration but even then abscesses are usually present in

some areas. The cellular reaction is usually limited and composed mostly of leucocytes and round cells (Fig. 7). When there is definite abscess formation they are lined by the usual pyogenic membrane— leucocytes, round cells, granular fibrous endothelial cells and fibroblasts (Fig. 18). The kidney usually shows evidence of renal changes, generally extensive cloudy swelling or complete destruction of the renal epithelium. It is this extensive involvement of the parenchyma most likely that makes the bearers of such kidneys so vulnerable to surgical operations. Some kidneys show lesions of different ages suggesting that the infection has been successive. Since this type of kidney is seen most commonly in old prostatics, fibrous tissue increase may be due to antecedent nephritis.

SYMPTOMATOLOGY

The hæmatogenous type is usually unilateral but by no means always so. Usually there is no definite antecedent disease unless intestinal disease, pregnancy, small abrasions in the lower urinary tract, tooth and tonsil infections, etc. may be considered as such. In typical cases there is a chill followed by high fever, even to 104 degrees or more, coming on in patients previously healthy. The chill may recur and the temperature remains high. It is characteristic of this type that the pulse remains low while the temperature is high. A temperature of 104 degrees, and a pulse of 80 is not unusual. The leucocytosis is high, 18,000 to 25,000 not infrequently being noted. The pain may be referred to the abdomen or down toward the bladder. Later on there is apt to be pain in the renal triangle. Usually there is tenderness over the kidney area and also there may be an area of tenderness over the abdomen particularly in the region of the gall bladder and appendix. The stormy general symptoms sometimes subside after a few days but may persist many weeks. The urine may show few or no changes in the early stages. Early in the disease a slight amount of albumen, some pus cells, and frequently a few red cells appear. Urinary findings are usually positive after a few days and may persist after apparent recovery. The picture then is that of a pyelitis.

In the type secondary to known infections elsewhere the symptoms are similar but are apt to be lost in the general pyæmic process. Tenderness in the kidney region and possibly urinary findings of a positive nature may be found. In those instances in which the kidney infection follows a localized suppurative lesion such as osteomyelitis, tonsillitis, or carbuncle, the clinical history stands out as clearly as in the primary type, the difference being that they are more apt to proceed to abscess formation.

The clinical problem in so-called ascending infections is different. The lower urinary symptoms precede the kidney infection. Some obstruction of the bladder outlet is followed by a pale, cloudy urine of low specific gravity. There may be some tenderness or spontaneous pain in the region of the kidney but it is not severe. The fever is slight but the pulse is rapid in comparison to the temperature, just the reverse of the relationship in the hæmatogenous type. Leucocytosis is low, and the polynuclear ratio relatively low. There may be even a leucopænia. When a perirenal abscess develops the leucocytosis may increase provided the patient has sufficient resistance to produce a reaction. The patient's general health declines markedly. Because of the disturbance in the lower urinary tract only the catheterized urine can be studied with advantage. The reaction is acid and there are many puss cells. the bacteria content is apt to depend on the age of the lesion, the older the infection the fewer the bacteria.

DIAGNOSIS

The problems of differentiation involve the distinguishing of these types from each other and from other diseases.

Hæmatogenous type. The rapid onset with fever and pain often distributed over the abdomen, suggests an abdominal crisis, appendicitis, gall-bladder disease, or a perforating ulcer of the duodenum or stomach. The absence of any urinary findings early in the attack is apt to heighten the confusion. The muscle rigidity is less pronounced and though rigidity is present it is not purposive in type. It is as if a tense band were pressed on without the increase in tenseness which is the case when a rigid muscle is protecting an inflamed

peritoneum. The temperature is higher than that occurring in appendicitis, 102 to 105 being common. The pulse rate is relatively low. With the high temperature just noted the pulse may be but 80 to 90. The chief symptom is the pain on deep pressure over the renal triangle. Here the muscle may show actual spasmatic contraction. If the abdominal muscles are not too rigid the kidney may be palpated and found enlarged. The leucocytosis is usually high, 20,000 to 25,000 and may be much higher. This high leucocytosis appears early even in the first day, much earlier than would occur in perforative appendicitis. After the urinary symptoms appear as above indicated, the diagnosis is materially aided. One must remember, however, that urinary changes may occur in appendicitis especially when the appendix lies retrocæcal. Likewise when the appendix lies in the pelvis there may be dysuria. Radiation of pain to the testicle comes only with kidney disease. In milder cases in which there is fever and later on urinary findings the unqualified diagnosis of pyelitis is apt to be made. The more closely these cases are studied the more apt is there to be found evidence of primary kidney lesion. There is lacking satisfactory evidence of primary pyelitis.

History of previous similar attacks may point to a possible gall-bladder attack. The value of a history of previous attacks may be much overdone for most likely hæmatogenous renal infections may be recurrent and may have in previous attacks been mistaken for renal colics.

Partial perforations of the digestive tract are localized at the point of disease and are not confused with the kidney because of the location of the pain in the epigastrium. Actual perforation produces a picture of agonizing pain not simulated by any other disease.

History in such grave disorders can have but a minor place. In such cases only the lesion in hand can be depended on to answer the question satisfactorily.

ASCENDING INFECTIONS

Here the antecedent factors must be considered in the diagnosis. It is often difficult to determine whether or not the symptoms are due to the disturbance in the lower urinary tract or if there is an added lesion. The urinary findings and the low fever and particularly the disturbance of urinary output are the determining factors.

TREATMENT

The justification for the classification which has been followed here is found in the aid it gives in the selection of the proper treatment. The hæmatogenous type may require operation. In the secondary type any local treatment is usually useless; and in the ascending type, which is bilateral, operative treatment is of no value unless there are perirenal abscesses.

HÆMATOGENOUS INFECTIONS

Brewer has well said that these cases may be divided into three classes: those in which nephrectomy is required; those in which nephrotomy or decapsulation is sufficient; and those which recover under general treatment. This classification has been the subject of great controversy. There is no guide except clinical judgment which admits of no hard and fast rules. If the onset is very stormy with chill, severe pain, and high temperature, particularly if this condition persists, the removal of the kidney must be considered. If after a few days the symptoms subside yet are moderately severe or if they persist over a long period, nephrotomy or decapsulation should be considered. If the symptoms are at no time stormy and tend to improve, general medication probably will be sufficient. This is the type which begins as a fairly classical infection and terminates as an ordinary pyelitis. When healing takes place without the development of pyelitis it must be assumed that the bacteria perished at the site of the local lesion. When they do not perish they develop a pyelitis. Numerous clinicians have noticed that those inspections beginning with a stormy course are apt to subside most quickly while the milder infections tend to form a pyelitis. Some have assumed that the former are due to cocci of little virulence while the latter are due to the colon bacilli. The argument is supported by what we know of the biology of these bacteria but actual

proof is wholly lacking. The important factor is to remember that we are dealing with a necrotic process without an actual tendency to abscess formation. That this is true, is shown best by the fact that when these kidneys are decapsulated the wounds heal without notable infection.

SECONDARY INFECTION

When the kidney becomes involved secondarily to a known infection one must be governed by the primary disease and the local symptoms. Those infections following tonsillitis usually clear up under general medication. Those following valvular lesions of the heart usually do not lend themselves to surgical treatment. If the patient has a localized infection such as a boil or a carbuncle and there is a complicating kidney lesion, nephrectomy probably will be required sooner or later. If the primary condition improves the progress may be awaited. This is the type which is most apt to be followed by perinephritic abscess. When abscess occurs simple drainage may be tried though nephrectomy may be required later on. When the kidney infection is a part of a generalized sepsis as from a septic injury or puerperal infection (streptococcic endocarditis) operation usually is futile since the kidney infection adds little to the picture.

ASCENDING INFECTION

The treatment of these is that of the primary disease. Only rarely is the kidney lesion sufficiently localized to admit of local treatment. If perirenal abscess occurs it must be drained irrespective of the state of the primary lesion. Usually no treatment is of avail because the kidney infection furnishes an incurable complication.

CONCLUSIONS

1. The lesions in hæmatogenous infections of the kidney are, in most instances, not abcesses but infarcts, the bacteria in these cases being of too feeble virulence to cause abcesses.

2. In such instances the constitutional reaction is due to protein poisoning and not to infection.

3. Various types of pyelitis are secondary to kidney infections of hæmatogenous origin and the chief factor in their treatment is the eradication of the source of infection.

4. Ascending infection of the kidney has not been proved. The location of the lesions indicates that bacteria in the urinary tract gain entrance to the blood stream and pass by this avenue to the kidney. The difference in character of the lesions is due to the difference in the offending organisms.

POSTERIOR DISLOCATION OF THE FOOT WITHOUT FRACTURE

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DISLOCATIONS at the ankle joint constitute 0.5 per cent of all dislocations. This percentage includes all four classes in which the foot as a unit is displaced from its position relative to the tibia and fibula. The four types are backward, forward, inward, and outward. In all four groups probably a majority of the cases are complicated by a fracture of the shafts of one or both of the long bones, by a fracture of one or both malleoli, and in the case of the backward or forward dislocation, by a fracture of the margin of the tibia.

Fig. 1. Photograph of foot showing dislocation.

The form in which the foot is displaced forward is the least frequently observed, the posterior displacement next, and commonest, the lateral.

Observers do not agree unanimously as to the possibility of a backward dislocation of the foot without fracture, but the consensus of opinion tends toward the belief that it does occur. Pels Leusden was unable to find a case in which there was no fracture. Ebel believes that a pure dislocation without fracture can occur. Quenu says that a posterior dislocation of the foot indicates the presence of a posterior marginal fracture of the tibia. Thomas recently reported 6 cases of posterior dislocation of the foot, each complicated by either a Pott's fracture or a posterior marginal fracture of the tibia. In his article he says: "Posterior dislocation of the foot may occur without fracture but it seems to be very rare. Auvray reported a case before the Paris surgical society during these discussions

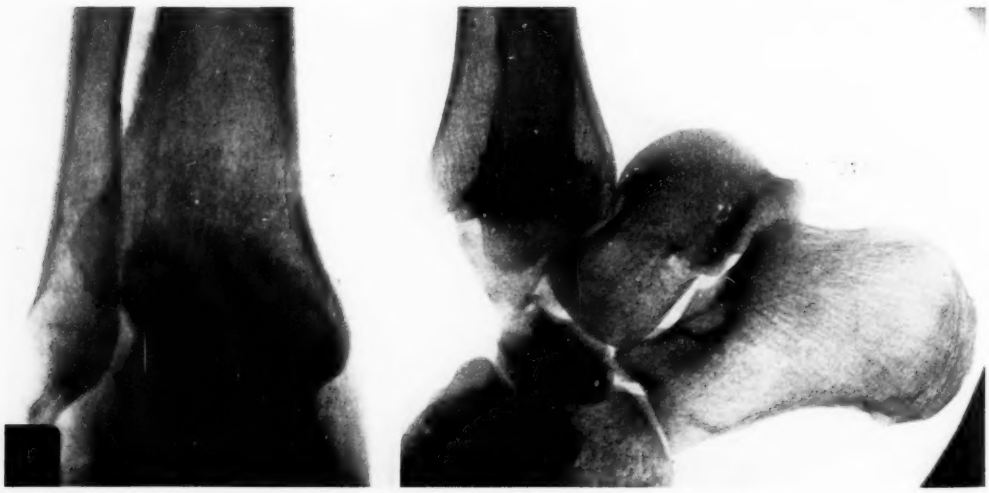

Fig. 2. Anteroposterior and lateral roentgenograms of dislocated foot.

in 1912 and exhibited the X-rays of it. After examination of them by members of this Society there was manifested a difference of opinion as to whether they showed a posterior marginal fracture of the tibia or not." Quenu says there is 1 certain case and 2 disputable cases of pure primary dislocation.

Denine reports a posterior dislocation with no fracture, but in his case there was no roentgenogram made. There is no question but that a marginal fracture can occur and be unrecognized if an X-ray is not taken. Thus, cases reported without X-ray findings are of no value as proofs of the existence of this condition. Bolton and Nason also report cases without X-rays. Richter reports 1 case of his own and 6 from the literature, complicated with fracture. He believes that pure uncomplicated luxations are extremely rare, if they occur at all.

The case which I wish to report is that of a backward dislocation of the entire foot at the astragalotibial articulation, without fracture.

The patient, a laborer, aged 61, was working with a heavily loaded hand truck. He was steadying a load on the truck with his right foot braced against the base. The truck became unbalanced and fell toward him, landing on his toes and pinning his foot to the floor. He was forced backward and fell with his foot fixed to the floor in extreme plantar flexion.

The patient was seen 40 minutes after the accident when the following picture presented itself. The ankle and foot were but slightly swollen and there was very little discoloration. There were minor contusions about his toes where the foot had been struck by the load. The dorsum of the foot was shortened and there was an abnormal prominence on the front of the ankle, formed by the anterior margin of the tibia. Both malleoli were anterior to their normal position. The heel was lengthened and very prominent and the line formed by the tendo Achillis was extremely concave. There was very little pain except on motion. The foot was held in moderate plantar flexion. The deformity was corrected in the following manner: Under nitrous oxide anæsthesia the knee was flexed to a right angle to relax the Achilles tendon following which the foot was put in a position of extreme dorsal flexion with force applied from behind acting downward upon the heel. A plaster cast was applied with the foot in slight dorsal flexion. Recovery was complete, both from a cosmetic and functional standpoint.

The accompanying X-ray pictures show no evidence of a fracture of either malleoli or the posterior tibial margin. The photograph shows the deformity of the foot before reduction.

In going over the literature I find that this is a rare condition and that there is even more or less difference of opinion as to the possibility of its occurrence. For this reason I am reporting what is apparently a posterior dislocation of the foot without fracture.

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DOUGLAS ABSCESS FOLLOWING THE CLOSED TREATMENT OF PERITONITIS

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IT is a well known fact that in the treatment of a general peritonitis it is impossible to drain the peritoneal cavity as such for a longer period of time than a few hours. In spite of this fact one is at first reluctant in those cases of a general purulent infection of the peritoneum to do away with some form of drainage as the old teaching has always been that where there is pus, drainage should be instituted. The experience in the Zurich surgical clinic has shown, however, that in these cases of general peritonitis following appendicitis the results obtained by primary closure of the peritoneal cavity are better than those obtained by the various forms of drainage.

The treatment used in the Zurich surgical clinic in all cases of appendicitis complicated with peritonitis is briefly as follows: At the operation the appendix is removed and all the exudate or pus, depending upon the stage of development, is carefully sponged out. Special care is given to the sponging out of the cul-de-sac of Douglas where practically always a collection of exudate is found. The peritoneum is then completely closed and the abdominal wall may or may not be drained. Drainage of the peritoneal cavity itself is never instituted in cases of *general* peritonitis. Following the operation the patient is placed in the extreme Fowler position with the head of the bed elevated so that he is virtually sitting up. Special attention is also paid to the giving of large amounts of saline solution subcutaneously.

The course which the peritoneal infection takes following such a procedure varies. In by far the larger percentage of cases there results a complete absorption of all the exudate which may have been left or have reformed following the operation. In a certain percentage of cases, however, in which the infection is more severe there results a collection of exudate in the cul-de-sac of Douglas which is the lowermost portion of the peritoneal cavity when the patient is in the extreme Fowler position. The fluid, because of its weight, naturally seeks this level during the first few hours following the operation. Later when the loops of intestine become somewhat adherent by the deposition of fibrin there results a fluid collection located in the most dependent portion of the peritoneal cavity bounded above by adherent intestinal loops. The reaction on the part of the peritoneum causing this formation of fibrin with its resulting adhesions begins much quicker and in a much more pronounced degree when one attempts to drain the peritoneal cavity with the various substances which are used for this purpose, such as rubber tubes, glass tubes, cigarette drains, etc. Because of this pronounced reaction on the part of the peritoneum when a foreign body is introduced into the peritoneal cavity, it is self-evident that the attempt at drainage of a generalized peritoneal infection by such means is impossible. The purpose of this paper, however, is not to discuss the closed method of treatment of peritonitis, so we will confine ourselves to the subject of the Douglas abscess.

ANATOMY

The cul-de-sac of Douglas is that portion of the peritoneal cavity which is located posterior to the bladder in the male, posterior to the bladder and corpus uteri in the female, and anterior to the rectum. With the body in the extreme Fowler position fluid within the peritoneal cavity easily finds its way into the cul-de-sac because of the natural furrows which are located on the posterior abdominal wall. On the right side between the ascending colon and the lateral abdominal wall and on

the left side between the descending colon, sigmoid flexure and left abdominal wall are two furrows which lead directly into the pelvis. The oblique course of the root of the mesentery also offers such a structure.

The cul-de-sac of Douglas exists under normal conditions as a capillary space between the two folds of parietal peritoneum. It extends in the female down to the uppermost limit of the posterior vaginal wall and in the male "recto-vesical space," its lowermost limit is located some distance above the prostate. The variation is considerable but these few landmarks represent the average case. Naturally the condition of the urinary bladder and rectum vary the size and shape of the cul-de-sac.

PATHOLOGY

Any infectious process within the peritoneal cavity may lead to the formation of a collection of exudate or pus within the cul-de-sac of Douglas. The inflammatory process in the ileocæcal region produces an irritation of the peritoneum resulting in the formation of a serous exudate which is at first sterile. Because of the close proximity to the pelvis this fluid naturally seeks the cul-de-sac of Douglas as the most dependent portion of the peritoneal cavity. If the collection of fluid in the cul-de-sac becomes large enough it may produce a bulging into the rectum which is palpable by digital examination. If the appendix is not removed at this early stage of the process or if the exudate is infected from the beginning there results an infected exudate in the cul-de-sac producing inflammatory changes in this region. If the patient is operated upon at this stage it is possible to remove the exudate and fibrin which already exist but the removal of all bacteria hardly seems possible.

Due to the inflammatory changes in the region of the cul-de-sac there results a doughy infiltration and induration of the various organs in this region. The examining finger, instead of feeling a large, soft, painless bulging in the rectum, now feels an indurated painful swelling, usually not so large. There exists a fluid collection within the cul-de-sac which is bounded above by the adherent loops of intestine and separated from the general peritoneal cavity. During its formation the intestinal loops were floated above the fluid line thus forming the upper boundary.

If the virulence of the bacteria is not great or the resistance of the individual considerable it is possible that such a process may be arrested and the exudate completely absorbed. If, however, these conditions are not present the exudate may become definitely purulent with the formation of an abscess in place of the infected exudate. As in all abscess cavities there results a thick pyogenic membrane encapsulating the pus.

With the abscess formation there results a number of inflammatory manifestations in the neighboring viscera. There is an œdema of the anal mucosa which to the examining finger feels thickened and succulent. This œdema causes an overproduction of mucus within the rectum resulting in diarrhœa. A paralysis of the external anal sphincter is also present and can probably be explained as due to a local action of the toxins upon the muscular coat of the rectum because there is also a dilatation of the ampulla of the rectum due to motor paralysis. This is comparable to cases of paralytic ileus resulting from peritoneal infection. There may also result an aseptic cystitis with disturbances in micturition due to an œdematous condition of the bladder. As in every other abscess formation the Douglas abscess tends to point, and in by far the majority of cases this is toward the rectum so that it is possible to feel in the center of the indurated bulging in the rectum a softened point which fluctuates. If untreated the abscess may perforate spontaneously into the rectum and thus heal spontaneously. In a certain percentage of cases, however, the perforation may take place into the bladder, into the free peritoneal cavity or even into the retroperitoneal space and thus produce very serious complications.

CLINICAL OBSERVATIONS

Among 700 cases of acute appendicitis treated during the last 4½ years in the Zurich surgical clinic we have had 39 cases (5.6 per cent) of Douglas abscess which required drainage. In addition to these cases

there were observed 23 cases (3.3 per cent) of Douglas infiltration which responded to conservative treatment. These cases include the lightest and the severest forms and they are in no way selected. In 27 per cent of all the cases the peritoneal exudate at the time of operation was found to be sterile. In at least 27 per cent it was already infected, and in the remaining 46 per cent there was either no bacteriological examination or no exudate was present. Of the 39 Douglas abscesses observed 25 had been treated with primary complete closure of the peritoneal cavity without drainage. This reduces the percentage of Douglas abscesses following the closed method of treatment of acute appendicitis to 3.6 per cent.

Of 22 cases in which the peritoneal cavity was primarily drained a Douglas abscess resulted in 4. In our series there are 14 cases in which at the time of appendectomy the cul-de-sac was found to be filled with a large collection of pus and the cul-de-sac primarily drained. Twice this drainage was done through the vagina and once through the rectum. All 3 of these cases died shortly after the appendectomy. They were, however, very advanced cases. The remaining 11 cases were drained by means of a rubber tube and gauze extending from the cul-de-sac out of the abdominal wound. In no less than 3 of these cases in spite of the primary Douglas drainage, drainage through the rectum was later necessary on account of the formation of a secondary abscess in the cul-de-sac. Thus the cases with primary drainage of the peritoneal cavity developed a Douglas abscess in 18.1 per cent and those with primary Douglas drainage in 27.2 per cent. Even though the difference between the primarily drained (27.2 per cent) and the undrained (3.6 per cent) cases is more apparent than real because of the difference in the number of cases observed, it is self-evident that the closed method of treatment of peritonitis following appendicitis is the method of choice. The advantages of this method are still more evident when one considers that the possibility of a postoperative hernia resulting from the drainage of a purulent process within the peritoneal cavity is eliminated.

The average length of time spent in the hospital was 37 days in cases of Douglas abscess which were primarily drained. For the cases of primary abdominal drainage the time was 35 days; and those treated by the closed method, 30 days. The average mortality in the cases treated by the closed method was 1.9 per cent while that for all the 700 cases drained or not drained was 4 per cent. The fatal cases in the closed treatment were all very far advanced at the time of operation.

SIGNS AND SYMPTOMS

For the early recognition of an inflammatory process in the cul-de-sac of Douglas the digital examination of the rectum is the most valuable means which we have. Beginning not later than the second post-operative day the patient should be examined daily in this manner even though the general condition of the patient and the local condition of the abdomen indicate nothing abnormal. For the carrying out of the procedure it is advisable that both the bladder and rectum be empty. As early as the second day one is able to detect with the examining finger a slight swelling in the anterior wall of the ampulla of the rectum which is somewhat tender. The tenderness is a diagnostic point differentiating a collection of fluid within the cul-de-sac from the filled loops of intestine which may lie within this space and give the impression that free fluid is present. It is essential when such a swelling is felt to examine the patient daily in order to determine whether the condition progresses or recedes as it may do within a few days.

The second stage of Douglas abscess formation is the Douglas infiltration which is characterized by the induration of the anterior rectal wall with an increased resistance when compared with the mere presence of an exudate within the cul-de-sac. This infiltration is usually located high up but as it progresses there results an increase in the exudate with the sinking of the palpable tumor which is favored by the sitting position of the patient. In Douglas infiltration as in cases of an exudate within the cul-de-sac the healing may be spontaneous, or the condition may progress into the formation of a true abscess.

With the formation of an abscess within the cul-de-sac of Douglas the swelling felt within the rectum becomes more pronounced and soon, especially after the proper treatment has been instituted, a softening occurs in its center which fluctuates. The tenderness upon pressure is also more marked and the spontaneous pain is increased.

A very important and diagnostic sign is the paralytic condition of the anal sphincter which during the rectal examination offers no resistance to the examining finger. The entire rectal ampulla is also dilated due to the muscular paralysis of the rectal wall. The mucosa of the rectum feels thickened and succulent to the examining finger and because of the existing œdema and hyperæmia there results the formation of a large amount of mucus causing frequent mucous stools. Exceptionally, however, the patient is constipated but because of the mucosal œdema is bothered considerably with tenesmus.

Inflammatory changes within the bladder comparable to those seen within the rectum are found. There may result a pronounced cystitis causing the various disturbances in micturition.

Besides the local manifestations the clinical picture is the same as that caused by a purulent process located anywhere within the body. The patient has an increase in temperature, increased pulse rate and an increased number of leucocytes in the blood. Often the patient presents peritoneal symptoms such as distention of the abdomen, tenderness, nausea and vomiting.

DIFFERENTIAL DIAGNOSIS

The possibility of mistaking the prostate or the uterus for an infiltration within the cul-de-sac is only to be mentioned. The possibility of confusing dilated intestinal loops filled with fluid located within the cul-de-sac of Douglas with the beginning Douglas abscess and its differentiation from the latter by the absence of tenderness has already been mentioned.

It is not uncommon on the third to fourth day after operation in cases treated by the closed method to observe a rise in temperature. This is, in by far the majority of cases, caused by a subcutaneous infection of the abdominal wound. A rise in temperature caused by a Douglas abscess usually appears later, from the sixth to the seventh day and examination of the abdominal wound quickly rules out the presence of an abdominal wall abscess. As mentioned above the digital examination of the rectum is our most valuable means of diagnosis and should be carried out very thoroughly and religiously. With the signs and symptoms mentioned a diagnosis can easily be made.

THERAPY

The treatment of a fully developed abscess in the cul-de-sac of Douglas is naturally surgical. When the presence of a definite abscess is known no time should be wasted before draining the abscess as perforation may occur into the bladder, peritoneal cavity, or retroperitoneal space.

A large percentage of inflammatory processes within the cul-de-sac respond very well, however, to conservative measures and for this reason the conservative treatment should always be instituted first and an operative procedure not attempted until a definite abscess is present.

The conservative treatment consists of application of heat which in the cases of the Douglas exudate may lead to absorption and in the more advanced cases of Douglas exudate hastens the formation of an abscess which may with safety be drained. For the application of heat to this region we have used a modification of the rectal cannula as devised by Arzberger for the treatment of prostatic affections. The cannula consists of a metal shell which is slightly curved and at its end somewhat dilated. Entering this capsule at the constricted end are two small metal pipes, one of which passes to the farther end of the capsule. Rubber tubing is attached to the metal tubes and hot water allowed to continually run through the cannula. The cannula is inserted into the rectum, as an ordinary enema tip and left in place from one-half hour to two hours. The temperature may be regulated by increasing or decreasing the flow through the cannula and by altering the temperature of the circulating water.

Usually when a rubber tube from 2 to 3 meters long is used it is desirable to have the water in the irrigating can at a temperature of about 40 degrees centigrade. The optimum temperature which should be used within the rectum is usually 38 degrees centigrade. This is the temperature which is most comfortable for the patient.

After a week of such convervative treatment there is usually a marked change in the patient's condition. In a certain percentage of cases the swelling felt within the rectum becomes smaller and tends to disappear. In those cases, however, which do not respond to conservative treatment the swelling becomes more pronounced, a softening occurs in its middle, and fluctuation is demonstrable. The finding of such signs by rectal examination establishes the diagnosis of an abscess within the cul-de-sac of Douglas and an operative procedure under all conditions is indicated.

OPERATIVE METHODS

Of the various methods advocated for the drainage of abscesses within the cul-de-sac of Douglas such as the perineal, the ischiorectal, the parasacral, and coccygeoperineal; the drainage through the rectum or vagina is the method of choice because of its simplicity. There have been a number of theoretical objections advanced against the drainage through the rectum. The danger of injuring a loop of the intestine is practically nil because in the formation of an abscess within the cul-de-sac, the intestinal loops, because of their gas content, are floated above the fluid collection. The danger of a secondary infection from the rectum is only apparent because in draining the abscess one opens an already infected cavity which is completely closed off from the remainder of the peritoneal cavity. The danger of a resulting hæmorrhage can be completely done away with if the incision is performed in the midline and in the long axis of the rectum. The objection that the drainage by this procedure is only temporary because of the inability to keep a drainage tube in the rectum for any length of time is also without ground. The abscess cavity is drained at its most dependent portion and after 2 or 3 days it completely empties itself. This is shown by the fact that in our 39 cases which were drained per rectum it was necessary in only 1 case to institute a secondary drainage.

OPERATIVE TECHNIQUE

Preceding the operation the patient is given a cleansing enema, and if the patient has suffered from diarrhœa he is given opium on the evening before and the morning of the operation. The urinary bladder is completely emptied.

The position of the patient on the operating table is the same as that for the usual vaginal and rectal operations. In the majority of cases it is unnecessary to use any anæsthetic because the dilatation of the anal sphincter which might be somewhat painful is, in practically all cases, already complete due to a temporary paralysis of the sphincter. If, however, it is necessary to stretch the sphincter this can be done under local anæsthesia according to Braun, or under general anæsthesia.

After complete dilatation of the sphincter the anterior rectal wall is exposed by means of large retractors placed in the rectum. The swelling formed by the abscess can be easily distinguished. A large aspirating needle attached to a syringe is inserted into the swelling at the point of softening. As soon as pus is obtained the syringe is removed but the needle is left in place, and an incision is made along the side of it so that a pair of large forceps can be introduced easily into the abscess cavity and the wound separated. A large rubber drainage tube is inserted into the abscess cavity, led out through the anus, and secured by means of a T bandage.

POSTOPERATIVE TREATMENT

For the first few days following drainage the patient is given small doses of opium in order to reduce the number of bowel movements. The drainage tube usually comes away with the first bowel movement any time from the second day on, and it is practically never necessary to reintroduce the tube. The wound in the rectal wall closes itself very quickly and following the drainage of the abscess the infiltration and the chronic inflammation in this region gradually disappear.

The position of the patient in the extreme Fowler position is maintained as long as there is any infiltration in the region of the cul-de-sac. As soon as the drainage tube has come out the Arzberger cannula is again used in order to hasten the absorption of whatever infiltration may remain.

Within 2 to 3 days after drainage of the abscess the temperature again assumes an entirely normal level and the general toxic symptoms disappear completely. As a rule after 8 to 10 days the rectal palpation yields an entirely normal condition.

In our series of 39 cases in which the Douglas abscess was surgically drained it was necessary in only 1 case to reintroduce (on the fifth day) the drainage tube which had fallen out on the second day. In this case, however, the primary drainage had been done through the posterior vaginal wall. In another case in which drainage had been instituted through the vagina it was necessary to later drain through the rectum. It would thus seem from this series of cases that the rectal drainage is preferable to the vaginal drainage in cases of abscess in the cul-de-sac of Douglas.

CONCLUSIONS

1. The cul-de-sac of Douglas represents the most desirable drainage site when it becomes desirable to institute internal drainage of the abdomen.

2. A Douglas abscess is a necessary occurrence and a desired complication in the closed treatment of peritonitis.

3. Sitting position of the patient and the intrarectal application of heat represent the conservative methods of treatment of Douglas abscess and also favor the production of a definite abscess.

4. Drainage of the abscess through the rectum is the simplest method. It gives the shortest convalescence and is therefore the method of choice.

A REVIEW OF 500 SELECTED LAPAROTOMIES

With Special Reference to Errors in Diagnosis

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ACCORDING to approved standards the abdominal surgeon is expected to commit himself to a written diagnosis before operation in each case and for that reason this review is attempted for the purpose of tabulating certain practical results from efforts at systematic procedure for diagnosis, for our sins of error in the past have proceeded oftener from a lack of system than from want of skill. Valuable as surgical technique may be it cannot rescue the hazard of a patient handicapped by a late or wrong diagnosis, and it is reasonable to believe that there is greater morbidity and mortality chargeable to wrong diagnosis than to clumsy surgery. To paraphrase a familiar quotation we would say that technique comes, but diagnosis lingers.

In addition to routine methods of diagnosis there should be stressed open-mindedness in the study of each case along with coördinated and constructive consultations. Snap diagnoses may hit the spot in a great percentage of cases because of the law of chance and because of referred cases already diagnosed, but in order to eliminate error in the minority of cases we must fall back on the rigid application of routine methods. The value of coördinated consultations cannot be overestimated because it matters not how great the experience of the busy individual surgeon may be, his cocksure methods of diagnosis occasionally go astray and no procedure obviates this error more effectively than consultations of experienced associates. We must make a distinction between perfunctory consultations and coördinated consultations because the latter require temperamental qualities in addition to scientific ability, for there may develop unconsciously an uncompromising attitude even in conscientious diagnostic procedure. Experience, however, will inevitably teach the value of reciprocity of even opposing opinions in the matter of diagnosis, for primarily a dissenting opinion may prevail through discussion and further clinical observation.

During an approximate period of 3½ years ending December 31, 1923, there were selected 500 records of laparotomies from 1,050 miscellaneous abdominal operations occurring in 3,050 case records of Harbin Hospital and for the purpose of diagnosis these were selected by eliminating certain classes in which the diagnosis was obvious, such as external herniæ, malpositions of the uterus, traumatic lesions, etc. Cases were further eliminated so that the ones chosen might represent as far as practicable one major pathological entity without supplementary operations in order that postoperative findings would reflect a more definite diagnosis. The diagnosis of an acute surgical condition within the abdomen warranting exploratory operation should be more than tentative and requires as much or more careful investigation than a diagnosis committed to a definite pathological entity.

In chronic surgical diseases of the abdomen the necessity for exploratory operation may be discerned with still greater difficulty and exploratory operation that fails to reveal a necessity for surgery should be charged to error in diagnosis. Progress in abdominal surgery has been made, not so much through improvement in technique as through the earlier application of operative treatment resulting from a refinement in the details of diagnostic procedure. The ambition for accuracy of diagnostic methods which awaits the development of classical symptoms has precluded improvement in morbidity and mortality statistics. While abdominal surgery has progressed through a refinement in methods of diagnosis from a stage of simply an antemortem statement of pathology to a phase of preventive medicine let us hope that minimizing the mortality from surgical diseases altogether may keep pace with the progress that has been won in preventive medicine.

GENERAL ABDOMINAL DIAGNOSIS

Critical studies in diagnosis checked against postoperative findings have demonstrated that certain pathological entities within the abdomen furnish certain definite symptoms which are fairly constant if analyzed and properly interpreted. Mistakes of diagnosis usually arise not so much from lack of skill as from failure to analyze symptoms in detail. This being true it is easy to discount the value of history taking by an office attaché or inexperienced assistants because an incoordinated voluminous record of history may be confusing.

On January 14, 1921, we undertook a report[1] of a study of the comparative values of different methods of diagnosis in 1,000 consecutive cases of general diseases with the following results expressed in percentages: clinical history method, 30 per cent; physical examination method, 45 per cent; laboratory, 8 per cent; and X-ray, 6 per cent. While having a suggestive value these statistics demonstrate where greater emphasis should be placed in diagnostic procedure. In these studies we should not forget that rare product of experience—clinical judgment.

In abdominal diagnosis there are two of the more common hazards to be reckoned with, neuroses and malnutrition, either of which may be independent or associated. Furthermore these conditions may be associated with actual pathology, each tending to obscure the other.

The stigmata of these respective conditions should be carefully scrutinized because unnecessary or exploratory surgery may become an extra hazard even in cases of actual pathology especially in the female pelvis and the prognosis should be guarded in order to obviate the liability of a dissatisfied patient who has been led to believe that an operation will cure everything. In the report above referred to, we found an average error of diagnosis in 3.3 per cent in 137 consecutive laparotomies in which errors amounted to 8.8 per cent in the female pelvis complex class of cases. So the relief a patient gets from surgery depends directly on the degree of causation set up by certain pathological conditions and in making these discriminations there is ever an element of unavoidable error to be reckoned with.

The following is a classified list of operations (or pathological reports): Appendicitis chronic, 63; appendicitis acute, 128; appendicitis perforative, 78; appendicitis abscess, 47; gall-bladder disease, 55; hysterectomies, 18; ovariotomies and salpingectomies, 63 (tubal pregnancies 7); intestinal obstruction, 22 (acute 13, chronic 9); gastro-enterostomies, 6; diverticulitis sigmoid abscess, 3; resection of descending colon for carcinoma, 3; removal of cæcum, 2; intestinal tuberculosis, 2; diverticulitis Meckel's, 2; carcinoma of liver, 1; sarcoma of cæcum, 1; pancreatitis hæmorrhagica, 1; perforated ulcer, 6. In this review it seems rather remarkable that only 10 operations revealed the presence of malignant growth within the abdomen and the incidence of Meckel's diverticulum was noted 5 times. Surgical shock *per se* was not recorded in any of these operations and incidentally during a period of 15 years only 2 fatal cases of shock were noted in those classed as average risks.

The total mortality rate following operations in this report was 30 (6 per cent) distributed as follows: appendicitis chronic, 0; appendicitis acute, 1 or 0.7 per cent (a death attributable to omission of drainage); appendicitis perforative, 8 (10 per cent); appendicitis abscess, 3 (6 per cent); gall-bladder operations, 3 (5 per cent); acute intestinal obstruction, 8 (58 per cent); diverticulitis Meckel's, 2; ulcer, 2; tubal pregnancy, 1; colectomy, 1; acute pancreatitis, 1; abscess of sigmoid, 1 (embolism).

There were only 3 deaths in 191 elective operations while in 309 acute conditions there were 27 deaths. Theoretically an early diagnosis would have rendered the total mortality rate negligible because there has been a stage in the history of development of surgical conditions within the abdomen where removal of the cause would have been practically without mortality if a correct diagnosis had been possible. So the problem of a low mortality rate is one of early diagnosis.

The object of this report will be (1) to

[1] Sectional meeting of American College of Surgeons for Alabama, Georgia and Florida.

verify the diagnosis of chronic appendicitis by a follow up record; (2) to discuss the value of leucocytosis in the very early diagnosis of acute appendicitis; and (3) to point out certain details of 17 (3.4 per cent) of cases of error in diagnosis and explain why 6 (1.2 per cent) of certain abdominal conditions were submitted to exploratory operations. It is better evidence of diagnostic efficiency to have a low percentage of exploratory operation even to the extent of increasing errors of diagnosis. While at times a postoperative diagnosis may become more or less difficult it was the rule in this series of cases arbitrarily to assign the major pathology as an index of the final diagnosis.

CHRONIC APPENDICITIS

It has been recognized that gross pathological findings in and around the appendix bear no direct relationship to the severity of symptoms of appendicitis because we occasionally see a case clinically diagnosed as peritonitis with a marked increase of leucocytosis where only a fibroid appendix may be found, while in an acute attack operation within a few hours may reveal an appendix greatly distended with pus giving only vague symptoms. The same observation may be made in the chronic type of the disease. In this type we incidentally remove an appendix grossly pathological which yet never seems to have given rise to symptoms, while apparently the innocent appendix would seem to be the only demonstrable cause of a long train of characteristic symptoms. It is perhaps true that nearly every acute attack is but a culmination of a chronic process of disease, symptoms of which would vary anywhere from negative to positive according to pressure brought to bear on the terminal nerve filaments.

From these general considerations we would conclude that the correctness of diagnosis of chronic appendicitis must frequently be subordinated to the clinical test of a follow up record and for that reason a certain amount of error is unavoidable. But according to the doctrine of probability established by experience, operation finds justification notwithstanding a certain amount of skepticism which may result from the fact that chronic appendicitis is often associated with minor pathologies which still perpetuate certain other symptoms. Aside from the chronic disturbances proceeding from the appendix, operation obviates the menace from acute attacks.

In the presence of infection when the lumen of the appendix becomes narrowed or closed, an attempt to demonstrate the presence of disease by X-ray is absurd.

While there would hardly be any excuse for failure in diagnosing diseased conditions of the urinary tract we should be mindful of the fact that there may be a joint association of a diseased appendix with certain obstructive and infective disorders of the urinary tract.

From inquiries sent to 62 patients one or more years subsequent to operation for chronic appendicitis there were 44 replies in which 33 cures were registered while 11 reported that they were suffering from ill defined disorders. It may be fair to assume that the 18 not heard from would show a greater percentage of cures. In the unrelieved class of 11 cases, 4 originally gave histories of previous attacks which of course have not been repeated and in the remaining 7 there were recorded collateral pathologies and supplemental operations and certain conditions of general disease which could explain failure of entire relief. So we would conclude that operation for chronic appendicitis is fully justifiable when we can get 75 per cent or more cures to say nothing of safeguarding the patient from subsequent attacks.

ACUTE APPENDICITIS

In the whole domain of surgery there is no hazard comparable to the treachery of an acute appendicitis and inasmuch as 80 per cent of the acute cases in which the abdomen was involved and approximately 60 per cent of the deaths in this report proceeded from the appendix the importance of an early diagnosis cannot be overestimated. Notwithstanding the general acceptance of this truth the mortality rate from acute appendicitis remains unwarrantably high. After the escape of infection from the appendix

friendly neighbors can usually make a diagnosis and it behooves the physician or surgeon to make a diagnosis before this stage arrives. Unnecessary as it may seem to the family, if attending physicians would make it a rule to request consultations in every case of suspected acute appendicitis the percentage of early diagnosis would increase while the mortality rates would show a corresponding decrease, more or less independently of the technique of the surgeon who must accept the responsibility as offered. While a comparison of statistics exceptionally becomes intelligent, an instance may be cited to demonstrate this inverse ratio. In a review[1] of 262 operations for acute appendicitis, 78 per cent were pus cases and the mortality rate was 8.7 per cent and in pus cases 9.1 per cent. In our own series of 253 cases of acute appendicitis the percentage of pus cases as indicated by the application of drainage was 51 per cent and mortality rate 4.7 per cent and in pus cases 11.2 per cent, which may indicate a better technique in pus cases in the former.

We believe that the leucocyte count offers one of the most reliable aids for an early diagnosis because it is a symptom which precedes the appearance of clinical evidences twelve or more hours. While the total count has a suggestive value, to wait for positive readings from a series of differential counts would indicate that the patient is well advanced in an active fight against a spreading infection.

We have undertaken to review 40 consecutive case records of acute appendicitis that did not require drainage, for the purpose of studying the leucocytic index where the infection was confined to the appendix. While a review of such a limited number of cases has no statistical value we have taken this number for the sake of brevity and tabulated certain results as of suggestive value.

Placing the normal count at 7,500 there were only 2 (or 5 per cent) cases of leucocyte count at or below normal and the general average count was 12,582 and the average percentage of neutrophiles was 74. While few cases would give all of the classical symptoms of acute appendicitis, this observation would lead us to believe that a marked increase of leucocytosis is a symptom more nearly constant for an early diagnosis and frequently casts the deciding vote for operation. We stress this observation for the reason that some surgeons seem to ignore the value of a leucocyte count, because occasionally it may proceed from other causes. Of course, no one for this reason would operate for a high count alone. Time will not permit a discussion of other characteristic symptoms of acute appendicitis. It may incidentally be remarked that urinalyses showed that albumin in varying quantities appeared in 23 (57 per cent) cases of acute appendicitis, pus in 12 (30 per cent), red cells in 4 (or 10 per cent), granular casts in 2 (4 per cent).

While a careful analysis of symptoms should differentiate pyelitis and other infections of the urinary tract from acute appendicitis, we should be prepared to recognize the coincidence of these two pathologies which belong to certain chains of infection especially from the tonsils, etc. Pyelitis of pregnancy especially in primiparæ furnishes an occasion for special study and renders the diagnosis of acute appendicitis more difficult but the bearing in mind the presence of high temperatures and the absence of marked gastrointestinal symptoms will help to avoid error. Sometimes, however, it may be well to hold these cases for observation at the risk of escape of infection from the appendix.

In reference to peritonitis and abscess of the appendix it may be stated that he who runs the risk of delay will read an unmistakable diagnosis.

GALL-BLADDER DISEASE

The historical entity of symptoms of gall-bladder disease is perhaps one of the most clean cut pictures we have in clinical diagnosis.

Among stout patients after middle life with intermittent attacks of upper abdominal pain that may have necessitated the use of morphine and that have covered a long period of time the condition simulates few other clinical conditions. From a practical standpoint the X-ray can be looked upon as only of occasional value.

[1] Gatch. Ann. Surg., June, 1924, p. 262.

Very recently we committed an error in diagnosing an acute intestinal obstruction in a married woman 28 years old who 7 years previously had an abscess of the appendix drained. The diagnosis was acute cholecystitis with stones. The attack having lasted less than 24 hours a cholecystectomy was comparatively safe notwithstanding the necessity of two incisions. There had been no definite history of gall-bladder colic, but this is a rare exception.

Another case reported later had a cholecystectomy in which the pain had proceeded from a tuberculous spine. In this series 2 cases of gall-bladder disease failed to be diagnosed. The number of cases of ulcer and carcinoma in this review are too small to warrant any discussion.

Diverticulitis of the descending colon offers peculiar difficulties in diagnosis and we have never been able to diagnose but 1 case of the quiet type in which a walnut size shadow persisted over a week. But in cases in which the diverticulitis has proceeded to the formation of abscess the diagnosis becomes clearer. During this year we have diagnosed a case of this type as obstruction from carcinoma. The fact that these abscesses in the left abdomen intermittently drain prolongs the development of a positive diagnosis.

FEMALE PELVIS

The female pelvis is responsible for a great variety of symptoms which proceed from general causes and unless actual pathology can be demonstrated, either before or after operation, surgery becomes worse than useless. In cases in which pelvic examinations by one or more consultants are negative, symptoms should be well nigh classical to warrant surgical procedure, because in exceptional cases actual pathology may not be recognized by pelvic examinations. Neuroses, malnutrition, visceroptosis, perineal relaxation, etc., along with preconceived opinions of the patient (at times shared by the family physician) that surgery is a cure all, tend to multiply the difficulties of correct diagnosis.

Four pelvic conditions were erroneously diagnosed as appendicitis in which 2 were pyosalpinx and 2 were tubal pregnancies.

Of course, our percentage of unrelieved cases from elective surgery in this class has been large because of certain collateral conditions mentioned, yet there may have been demonstrable pathology in the pelvis.

REPORT OF 17 CASES OF ERROR IN DIAGNOSIS

CASE 1. (4485.) A married woman, age 28, with 2 children, had more or less uterine hæmorrhage for 6 months with leucorrhœal discharge and bladder distress. Dull aching in right pelvis kept her in bed at times. She had had a curettage 3 months previously. Blood, urine, and pelvic examinations were negative. The patient suffered from fatigue and nervousness. Pre-operative diagnosis was recorded as salpingitis. After repairing the cervix and perineum, laparotomy revealed a negative pelvis and chronic appendicitis with omental adhesions.

CASE 2. (1252.) A married nullipara, age 25, entered the hospital with a history of 2 miscarriages. She had missed one period having had some nausea with slight hæmorrhage. Physical examination read, "mass in right pelvis size of an orange and movable, not tender. Possibly tumor or extrauterine pregnancy." Postoperative findings were incomplete abortion and subacute appendicitis.

CASE 3. (4936.) Mrs. Blank, age 74, gave history of abdominal distention and constipation for 4 months. The barium enema blocked in the sigmoid and the barium meal stagnated at the same point. Subsequent enema showed "irregular lumen of sigmoid." Pre-operative diagnosis was intestinal obstruction and postoperative record read intestinal tuberculosis. The absence of vomiting and cramps should have had greater emphasis.

CASE 4. (3860.) A male, age 47, gave a history as to abdominal trouble. Sudden pain began at epigastrium 2 days previous and gravitated to the lower left. There was no vomiting but stagnation of bowel movements and gas was complete. Temperature was normal and leucocyte count 14,000. The preliminary diagnosis was acute intestinal obstruction and final diagnosis was general peritonitis from perforated appendix from which death was recorded. The leucocyte count and absence of vomiting should have rendered the diagnosis of obstruction doubtful.

CASE 5. (3676.) A married woman, 41 years of age, rather emaciated, gave a history of colic-like pains during pregnancy 5 years previously and 2 years later pain was repeated and lately more acute. A pyelogram was negative. The preliminary diagnosis was high abdominal tumor and operation revealed a large hydropic gall bladder with stones.

CASE 6. (3746.) A married woman, age 31, gave history of 4 acute attacks of abdominal pain during the last 6 months followed by soreness and tenderness. She had just recovered from a severe attack which started 10 days before. A diagnosis of sub-

siding appendicitis was recorded but operation revealed in addition to a pathological appendix a small ovarian cyst and a marked chronic cholecystitis.

CASE 7. (1535.) In the case of Mrs. Blank, age 47, a diagnosis was made of acute appendicitis but operation revealed an intestinal obstruction from tuberculosis. Comments were negative.

CASE 8. (3168.) Miss Blank, age 19, pupil nurse, had during the previous year right abdominal pain and soreness and for a week there was persistent aching and slight nausea. The urinalysis was negative and leucocyte count 8,700. Diagnosis was recorded subacute appendicitis and operation revealed a diverticulitis, Meckel's.

CASE 9. (3495.) A married woman, age 50, nullipara, weighing 172 pounds, had for 16 months severe pain in midscapular region radiating through chest with pain on bending. There was much gas but no vomiting, sour belches, jaundice, or rise of temperature. X-ray of the gastro-intestinal tract was negative. The diagnosis was cholecystitis. A tense gall bladder and the appendix were removed. The patient was not relieved and the X-ray subsequently revealed tuberculosis of the dorsal spine. Reviewing the history again we found a break in the chain of clinical evidence of gall-bladder disease.

CASE 10. (1964.) A physician, age 51, gave the following history, two years before operation: For 25 years it was easy to vomit with heaviness after meals, recurring attacks of pain followed by soreness which required morphine. There was no jaundice. The X-ray examination was negative. Diagnosis rated cholecystitis 75 per cent and duodenal ulcer 25 per cent.

These exacerbations kept up until operation which revealed a duodenal ulcer. A history of this duration indicating gall-bladder trouble should have shown a greater number of more violent attacks of pain.

CASE 11. (2656.) A married woman, age 28, weight 220 pounds, having 2 children, gave history of 3 acute attacks of upper abdominal pain. The present attack began 36 hours previously, the pain radiating about the umbilicus with great violence. A diagnosis of acute appendicitis was made and operation revealed a hæmorrhagic pancreatitis which proceeded to a fatal issue.

CASE 12. (4740.) A girl, age 15, gave a history of ill defined illness for three weeks but came to the hospital for relief of right abdominal pain which had been slowly progressing for 10 days with a rather constant rise of temperature and an occasional vomiting. Urinalysis showed some pus and albumen and the leucocyte count was 23,000, widal negative, X-ray of chest negative. The case was held for observation with a provisional diagnosis of right sided abdominal inflammation probably appendicitis. Operation revealed a wide area of necrotic omentum which had protected a healed typhoid ulcer.

CASE 13. (4718.) A man 50 years of age complained of stomach pain for 8 months with recurring acuteness more constant for 6 weeks. The urine, blood, and an X-ray of the stomach, were negative. The diagnosis was ulcer of the duodenum. The operative findings were carcinoma of the liver.

CASE 14. (3050.) A boy, 10 years of age, complained of pain and distention of abdomen which had increased for two weeks with occasional vomiting. Enemata would return immediately. Leucocyte count of 18,000 and X-ray of abdomen were negative. Pre-operative diagnosis of tuberculosis of the peritoneum was recorded and laparotomy revealed a large cyst of the mesentery at the splenic flexure of the colon.

CASE 15. (3633.) A girl, age 14, has had more or less right pelvic pain for 2 weeks requiring the use of morphine. She primarily had vomiting, and the leucocyte count was 22,000. The patient returned to the hospital 2 weeks later giving the same symptoms, leucocyte count 8,800, and temperature 102. Pre-operative diagnosis was appendicitis but operation revealed a double pyosalpinx. While the age of the patient would seem to render pelvic infection less probable, the duration of the symptoms and temperature record tended to exclude the diagnosis of appendicitis.

CASE 16. (2712.) A negress 33 years of age, married and having one child, complained of right abdominal pain. She had missed one menstrual period. She had 2 attacks of upper abdominal pain, with vomiting followed by soreness, requiring the use of morphine. There was no uterine discharge. Urinalysis was negative and leucocyte count was 12,700 and pelvic examination negative. Provisional diagnosis was acute appendicitis. Operation revealed a left tubal pregnancy.

CASE 17. (4140.) Mrs. Blank, age 30, nullipara, 2 weeks before apparently had an abortion. The present attack gave a very acute abdominal pain over the region of the appendix. Urinalysis was negative and the leucocyte count was 12,800. A diagnosis of acute appendicitis was recorded but operation revealed a ruptured left tubal pregnancy.

REPORT OF SIX CASES SUBMITTED TO EXPLORATORY LAPAROTOMY

One child and one man had malignant tumors of the abdomen and exploratory operation was negative.

CASE 18. (4497.) A married woman, age 38, had 2 children and complained of lower abdominal pain, which had been slight for 2 months and severe for 2 weeks. Urinalysis showed albumin and casts and leucocyte count was 18,600 and hæmoglobin 45 per cent. The exploratory operation revealed a large and twisted necrotic fibrocyst of the right ovary.

CASE 19. (4978.) A single man, age 22, suffered from upper abdominal pain. One year previously he had lower abdominal pain with vomiting lasting 2 weeks followed by soreness. The present attack

began 2 weeks ago with pain in upper abdomen without vomiting, temperature ranging from 100 to 102. Urinalysis was negative and leucocyte count 20,200. The X-ray showed the stomach displaced to the left by a mass along the lesser curvature. He was held for observation for 2 days and then submitted to exploratory operation which revealed a subacute appendicitis pasted to the posterior wall of the cæcum and displaced upward.

CASE 20. (3810.) A negro, age 27, had had stomach trouble for 5 years averaging 2 acute attacks a year. He was easily nauseated and had soreness in the right side following these attacks. Urinalysis showed albumin and much pus and the leucocyte count was 6,000. Exploratory operation revealed chronic appendicitis.

CASE 21. (4041.) Miss Blank, age 27, had pain in the left side for 8 months, worse after eating. She had repeated vomiting. The general condition was poor and neurotic. The diagnosis was recorded as "undetermined."

Six months later she consulted another clinic and had the left kidney removed for tuberculosis according to her statement. After another 6 months she returned more emaciated with the same complaint. Blood, urine, Widal, Wassermann, spinal fluid, and barium colon tests were negative. Diagnosis was still undetermined and at the urgent request of the family and attending physician exploratory laparotomy revealed the presence of a shrunken mushroom shaped Meckel's diverticulum about 14 inches from the ileocæcal valve. Other findings were negative and at the last report the patient was unimproved.

CONCLUSIONS

1. Systematic diagnostic procedure should stress open mindedness, coordinated and constructive routine consultations, and a commitment to a written pre-operative diagnosis.

2. This record of 500 laparotomies was selected from 1,050 miscellaneous abdominal operations occurring in 3,050 case records.

3. The average error in diagnosis was 3.4 per cent and cases submitted to exploratory operation were 1.2 per cent.

4. Progress in abdominal surgery has been made not so much by improvement in technique as by the earlier application of surgical treatment through the development of a more rigid diagnostic régime, thus constituting a phase of preventive medicine.

5. Waiting for classical symptoms has made impossible improvement in morbidity and mortality statistics.

6. Neuroses, malnutrition, visceroptosis, functional disorders in the female pelvis, etc., create hazards in abdominal diagnosis.

7. There were 191 elective operations (3 deaths) and 309 acute abdominal conditions (27 deaths) with a total death rate as follows: appendicitis chronic 0, appendicitis acute, 0.7 per cent appendicitis perforative 10 per cent; appendicitis abscess, 6 per cent; gall-bladder operations, 5 per cent; intestinal obstruction, acute 58 per cent, etc. There was no record of shock *per se* in these cases.

8. A follow up record of cases in order to corroborate the diagnosis of chronic appendicitis shows .75 per cent of cures.

9. Eighty per cent of the cases in which there were acute abdominal conditions, and 60 per cent of all deaths proceeded directly or indirectly from the appendix.

10. In the early diagnosis of acute appendicitis the leucocyte count frequently casts the deciding vote in favor of operation.

11. In the presence of positive urinary findings the joint association of infections in the urinary tract and appendicitis should be considered.

12. Gall-bladder disease furnishes perhaps one of the most definite clinical histories we have but 1 case of error of diagnosis was made in a case of tuberculosis of the spine.

13. Diverticulitis of the descending colon furnishes a peculiar problem of diagnosis in the left abdomen.

14. The following conditions failed to be properly diagnosed: appendicitis 3, gall-bladder disease 2, tubal pregnancy 2, tuberculosis of intestines 2, tuberculosis of spine 1, Meckel's diverticulum 1, duodenal ulcer 1, acute pancreatitis 1, perforated typhoid ulcer 1, carcinoma of liver 1, cyst of mesentery 1, pyosalpinx 1.

THE MODERN THEORIES OF ELECTRICITY IN THEIR BEARING ON ROENTGENOLOGY[1]

By GUSTAVE KOLISCHER, M.D., Chicago

THE modern theory of electricity is based on a few fundamental propositions which are included under the name of the undulation theory.

While it is true that some of these propositions are of a merely speculative nature, still they not only satisfactorily explain the natural phenomena occurring in electrical disturbances and displays, but they also form the basis of the construction of the electrical apparatus used in technology and medicine.

In the first proposition we assume the existence of an imponderable, omnipresent materia that is called the universal ether. This substance penetrates everything and is extremely susceptible to mechanical, electrical and magnetic impulses.

We furthermore assume the existence of a certain potentiality inherent in the smallest particles of matter, denominated as electricity. We distinguish two kinds of electricity, the positive and the negative. Equal amounts of opposite electricities neutralize each other—particles charged with the same kind of electricity repel each other, while particles carrying negative and positive electricity attract each other.

Atoms heretofore considered as the smallest components of matter are in fact composed of a number of smaller corpuscles which carry the smallest units of electricity. These smallest bodies (they are eighteen hundred times smaller than the hydrogen atom) are called electrons.

It is thought that each atom consists of one or several nuclei charged with positive electricity and a number of peripheral electrons charged with negative electricity. The negative electrons revolve around the nuclear mass in the same way that the planets revolve around the sun. In order to make an atom electrically neutral or inert, the sum of negative electricity carried by the peripheral electrons must be equal to the amount of positive electricity inherent in the nucleus.

If negative electrons are removed from such a compound, the charge of the nucleus will preponderate and the atom will become electrically positive; while if an afflux of negative electrons occurs, the atom will turn into an electrically negative one.

If by some impulse a number of electrons are stampeded in one direction, this movement is called an electronic ray.

If the molecules of gases or fluids are split up into atom groups of positive and negative preponderance respectively then we speak of dissociation or ionization of the molecules, and their splitting up into negative and positive ions.

The positive ions, the cations, are attracted by the negative pole, the negative ions, the anions, by the positive pole.

The traveling of ions constitutes the conception of an electrical current, the conduction of which depends upon this locomotion of the split products of the molecules. While the conductivity of fluids depends upon the velocity of the locomotion of the ions, the electric conductivity of metallic conductors depends upon the locomotion of electrons.

In order to explain the measuring of electric currents, the comparison with the flow of water is used.

In the same way that water will flow from a higher level to a lower one, the electric current will flow from the higher tension to the place of lower. The unit for measuring the tension of an electric current is called a volt.

The intensity or velocity of the electric current is measured by the amount of constant current necessary to precipitate 118 milligramm colloid silver in one second. This measuring unit is called an ampere. The unit of resistance to an electrical current is represented by a column of mercury 1 millimeter long and 1 millimeter in diameter and is called an ohm.

The product of multiplication of volt and ampere is called the unit watt.

[1]Read before the Chicago Gynecological Society, March 21, 1924. (For discussion, see p. 300.)

For the understanding of the functioning of X-ray tubes the following observations and considerations are paramount: If through a glass tube into whose opposite poles electrodes are soldered, an electrical current of high tension is forced, no light display is observed within the tube as long as the pressure within the tube corresponds with the manometric pressure of 760 millimeters of the mercury column. But as soon as the gaseous contents of this tube are reduced to the pressure of about 6 millimeters, a violet band of light springs up between the electrodes. This illuminated band does not reach completely the anode, but its end is separated from the latter by a dark space. If the pressure within the tube is successively lowered, this illuminated band is accordingly and progressively shortened until when a certain low pressure is reached it will disappear entirely. At the same time another phenomenon is observed. The portion of the glass opposite the cathode lights up, it fluoresces.

This phenomenen is explained by the supposition that from the cathode there emanate rays, electronic rays that remain invisible until they hit the glass wall where by their absorption they produce fluorescence.

A close study of these cathode rays has demonstrated that they possess the following qualities: They emanate from the cathode at right angles, they produce fluorescence in the part of the glass wall they are impinging upon, they may be diverted by magnetic influence, they produce heat in the matter they are hitting, they are able to produce also mechanical impulses. This latter fact helps support the supposition that the cathode-rays are not undulations but consist in the rapid locomotion of electrons that are propelled from the cathode. The cathode-rays are completely absorbed by the wall of the tube.

Later on it was found by Roentgen that in the very moment that the cathode rays hit the glass wall of the tube they give rise to the emanation of other rays from this spot, rays that are not of a corpuscular nature, but are undulations of the universal ether. Those are the X-rays or Roentgen-rays.

A part of the mechanical energy of the electron rays is transformed into caloric energy, another part is used to produce the ethereal undulations.

The degree to which a material body is able to emit X-rays after being hit by cathode rays depends upon its peculiar absorbing power. Consequently very dense material is chosen for the spot at which X-rays are to be produced. This spot, the anti-cathode, is made out of very heavy metal, platinum.

X-rays are equipped with a low energy only, consequently their production of heat is negligible.

Characteristic qualities of the X-rays are: They spread in a straight line in all directions. They are not to be deflected by magnetic influence, and hardly at all by prisms of crystal. They produce fluorescence in appropriate materials, they penetrate all materials according to their specific gravity and thickness. They produce in the medium impinged upon secondary rays. They have a definite influence upon living cells. They blacken the photographic film.

The varying capacity to absorb rays of various matters according to their intrinsic constitution makes roentgen photography possible by the varying degree of blackening of the photographic films.

The influence upon living cells makes the X-rays a potent therapeutic factor. According to the quantity and quality of the rays absorbed the cell may either have its resistance lowered, its function paralyzed, or it may be destroyed by necrobiosis or by necrosis.

The penetrating power of the X-rays depends upon the length of the waves—the shorter the waves the greater the penetrating force. Waves of greater length are called soft rays, rays of short waves are called hard rays. It must be understood that when X-rays are produced, a mixture of rays of varying degrees of hardness is created. The length of the waves depends upon the character of the initial impulse brought to bear upon the cathode. The higher the tension of the electric current forced through the cathode, the greater the velocity of the locomotion of the electrons, and in turn the fastest electron rays will produce the hardest X-rays. Therefore in the modern therapeutic X-ray apparatus, currents of extremely high voltage are used.

In the so-called filtration of rays, use is made of the variation in the power of soft and hard rays to penetrate, and in the power of heavy materials to absorb or to stop the rays.

Between the object to be rayed and the X-ray tubes are interpolated sheets of metal which according to their peculiar chemico-physical construction enable the operator to keep soft rays off the bodily surface, while only the hard rays that penetrate the superficial layers without becoming absorbed in this stratum are permitted to reach the body.

X-rays used for therapeutic purposes must be measured as to the quality, whether hard or soft and as to the quantity administered. The apparatus for measuring the penetrating power are called qualimeters and sclerometers. Their construction is based upon the peculiar absorptive power of the interpolated substances. The method of measuring the quantity of X-rays administered depends upon whether superficial or deep X-ray therapy is used. In the former instance the quantity of rays is measured by the intensity of the decomposition and subsequent blackening of appropriate substances. In deep therapy the quantity of rays is measured by electrometers that are encased in a chamber.

The normal atmospheric air is a poor conductor, consequently the discharging of a loaded electrometer will consume considerable time. If, however, the air in the containing chamber is ionized by X-rays the air becomes a good conductor, consequently the discharge of the electrometer will be accomplished in a short time.

The time that elapses between the charging of the electrometer and the re-approaching of its gold leaf blades permits the formation of conclusions as to the quantity of rays passing through the chamber containing the electrometer.

DEPARTMENT OF TECHNIQUE

VESICOVAGINAL FISTULA—UTILIZATION OF THOROUGH DISSECTION OF THE ANTERIOR VAGINAL WALL FOR CLOSURE[1]

By THOMAS J. WATKINS, M.D., F.A.C.S., Chicago

THE purpose of this paper is to advocate thorough dissection of the anterior vaginal wall in the operative treatment of cystocele; to note the importance of retraction and fixation of the injured tissues; to give a hopeful prognosis in many cases where the vesical sphincter seems to be irreparably damaged; and to present a plan for obtaining adequate mobilization.

Thorough dissection should always give good exposure of the injured tissues, and should generally supply sufficient mobilization for closure without tension.

The vaginal mucosa is freed by blunt dissection with scissors as in repair of cystocele.

The dotted lines (Fig. 1) show the location of the incisions which are made during the process of blunt dissection with scissors.

In Figure 2 the edges of the vaginal flaps are held with forceps and the mucous membrane is "skinned off" with a sharp scalpel. This dissection results in formation of flaps shown in the illustration. In vesicovaginal fistula the tissues refract and become fixed; for example, in much the same manner as in ventral hernia. This retraction and fixation occur chiefly at the site of the scalpel, illustrated in Figure 2, because it is at this point that the fascia is the strongest and most firmly fixed. The retraction is most pronounced in cases of urethral injury. I have observed two patients in whom this form of retraction was so much, after excision of urethral neoplasms, as to produce urinary incontinence. This retraction and fixation is an important factor in the treatment of apparently hopeless cases of injury of the vesical sphincter—the sphincter being retracted and fixed and not completely destroyed. This, at least, has been the impression received from experience. Deep lateral dissection is also valuable in obtaining mobilization.

Separation of the bladder from the cervix by blunt dissection as shown in Figure 3 is necessary only in *exceptional cases*. It is especially valuable when the fistula involves the cervix and is essential if a maximum amount of mobilization is desired.

Incision and ligation of the broad ligaments can also be utilized for releasing the upper part of

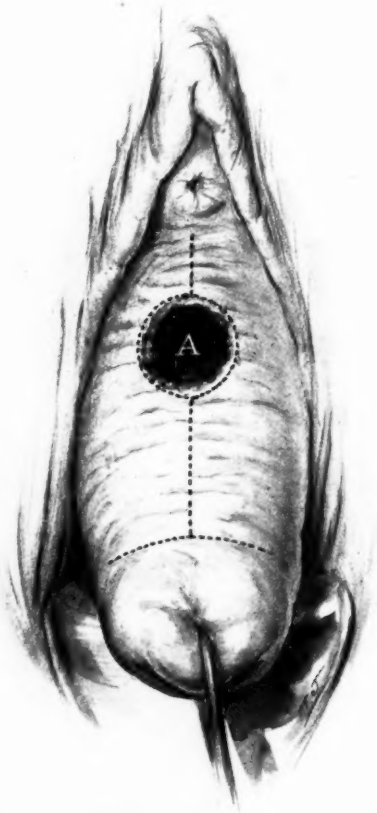

Fig. 1. *A*, Fistula. Dotted lines indicate location of incisions.

[1]Read before the American Gynecological Society, May 16, 1924.

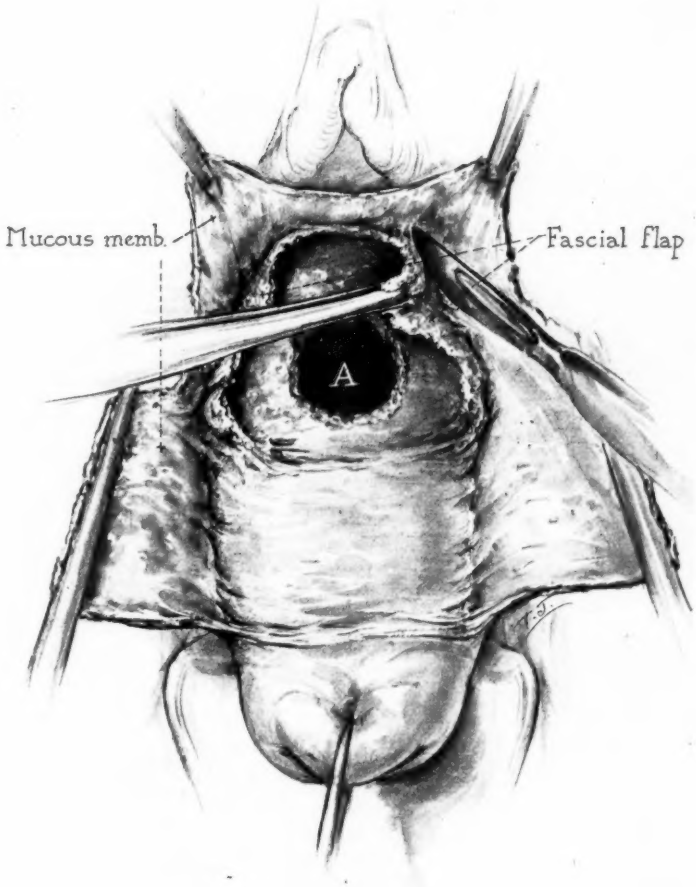

Fig. 2. *A*, Fistula. The mucous membrane flaps have been "skinned off" as superficially as possible—fascial flaps result. Deep dissection where the scalpel is seen is important, as it mobilizes retracted and fixed tissues, in cases of urinary incontinence.

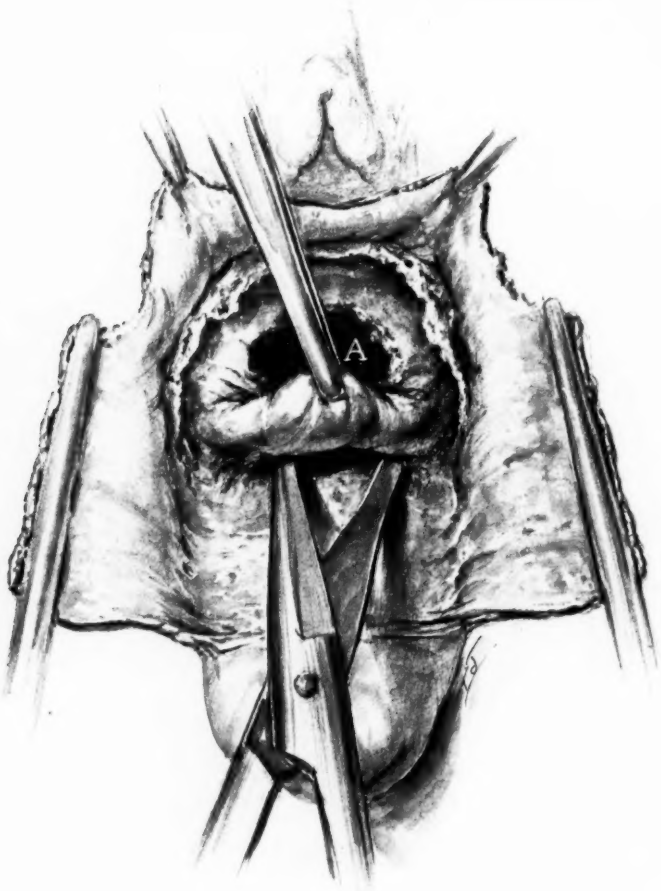

Fig. 3. *A*, Fistula. The bladder is separated from the cervix by blunt dissection *when necessary* to permit closure of the fistula without tension.

the bladder. This does not endanger the ureters as would extensive lateral separation of the bladder and tends to lessen the probabilities of shortening the vaginal canal. It is advised only for repair of the very difficult cases. Figure 4 visualizes the degree of mobilization and the effect upon the fistula, which disappears when the bladder is elevated with the narrow retractor. The great amount of mobilization which is possible to obtain is well illustrated in a patient operated upon some 2 months ago, when only about 1 inch of vesicovaginal septum remained in the upper part of the vaginal canal. The septum distal to this including the urethrovaginal septum had been entirely destroyed as a result of amputation of a urethral tumor and repeated operations for repair. The mobilization obtained permitted bringing the upper part of the fistula down near to the site of the meatus urinarius with very little tension, where it was sutured with the result of

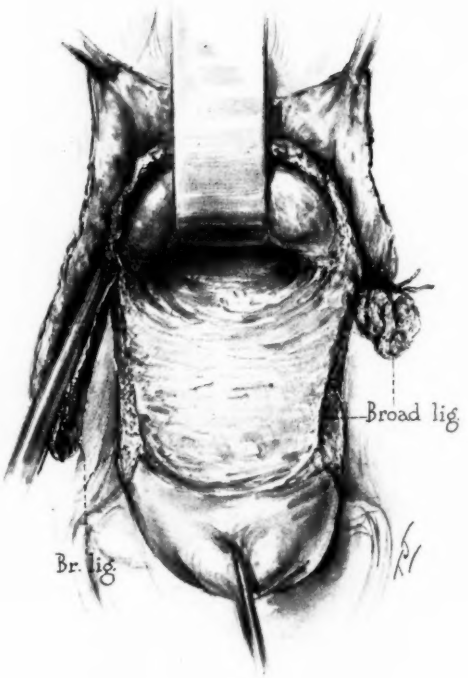

Fig. 4. The right broad ligament has been clamped and incised. The left broad ligament shows appearance after ligation. The bladder is displaced by retractor to demonstrate the extent of mobilization. Incision of broad ligaments is needed only in *exceptional cases*.

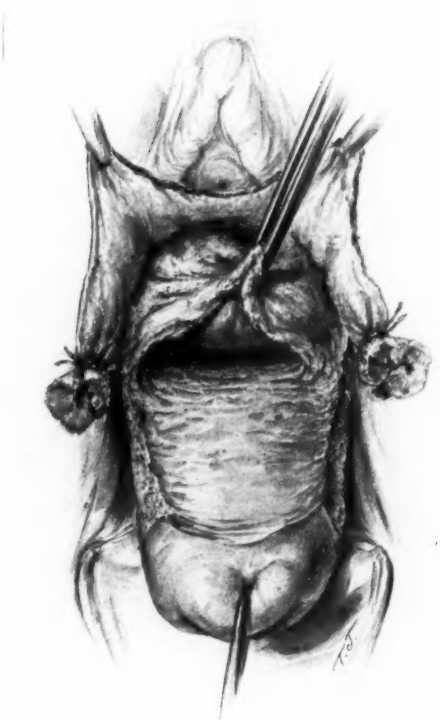

Fig. 5. The free edges of the fascia are brought together over the fistula and held by our forceps to illustrate the extent of mobilization.

perfect urinary continence, except on standing. The vesical sphincter had apparently retracted and became fixed as mentioned above.

Figure 5 shows the fistula closed by approximation of the free edges of the fascia by means of a tissue forcep. The fistula can now be easily closed by buried catgut or silkwormgut sutures. We prefer closure with silkwormgut employing mattress or figure-of-eight, or a combination of mattress and figure-of-eight sutures. Tissues about all infected fistulæ are not especially suitable for closure with buried suture. The choice of suture may seem of minor importance, but primary union is of vital importance to the patient.

In cases of involvement of the vesical sphincter, deep lateral dissection and firm closure is especially important to obtain urinary continence and prevent retraction. The rest of the wound is closed in the usual manner, care being used in suturing the broad ligaments and mucosa not to narrow or shorten unnecessarily the vaginal canal.

SUMMARY

1. In closing vesicovaginal fistulæ thorough dissection of the anterior vaginal wall always gives good exposure, supplies a maximum amount of mobilization, and conserves tissue.

2. Retraction and fixation of the injured tissues in chronic cases is an important factor in the pathology and the operative treatment, especially when the sphincter is involved.

3. Deep lateral dissection and firm suture may establish urinary continence in cases in which the vesical sphincter seems to be irreparably damaged.

A NEW DRAIN AND ITS APPLICATION TO PELVIC DRAINAGE

By CHARLES L. LARKIN, M.D., F.A.C.S., Waterbury, Connecticut
Attending Gynecologist, St. Mary's Hospital; Assistant Attending Gynecologist, Waterbury Hospital

A SATISFACTORY drain must be soft and pliable and have numerous surfaces in apposition, making a large total area of capillary attraction.

The author's contribution as shown in the accompanying drawing is such a drain. It is made of pure dental rubber gum sheet, 0.01 inch in thickness, rolled into a cylinder. The free edge is caught at intervals by interrupted silk sutures to prevent the rubber from unwinding. Holes one-half inch apart are punched through the drain and along its entire length by means of an ordinary ticket punch.

Such a drain can be made any length desired.

The diameter can be varied according to how tightly the rubber is rolled and by the number of turns taken. A piece of rubber gum sheet one foot square rolled loosely until the diameter is one-half inch makes a drain with twenty adjacent surfaces.

The punched out holes must be large enough to allow purulent fluid to gain entrance to the inner layers of the drain. Caution must be observed to remove all the punched out pieces of rubber. The drain should be wiggled forcibly around each hole to loosen any adherence of the layers that may have been caused by the punch.

The drain should be well soaked in sterile fluid before using, and when once wet it must be kept moist, otherwise the surfaces will closely unite preventing drainage.

Fig. 1. Drawing showing detail of drain.

It is not only necessary to lead body discharges from the bottom of the drain to the top, but they must be led out of the drain itself. This can be accomplished by making the drain long enough to allow 3 or 4 inches to lie outside the wound upon the skin or mucous membranes or between layers of gauze. These, by their capillary attraction or absorbent property, will lead the fluid out of the drain.

Figure 2 illustrates the application of this drain to the pelvis. It is well understood that the pelvic peritoneum will take care of nearly any infection. But there are times when, after an abdominal incision, the pelvic condition is found to be such that thorough drainage is necessary. This has been attempted by leaving a drain in the abdominal wound, or one in a posterior colpotomy wound, or both. With this method the drainage obtained by the abdominal wound is slight, if any. The drain in the posterior colpotomy wound usually falls out in a day or two, and the wound closes.

In this type of case the writer has employed the above described drain in the through and through method. The upper end projects about 3 inches,

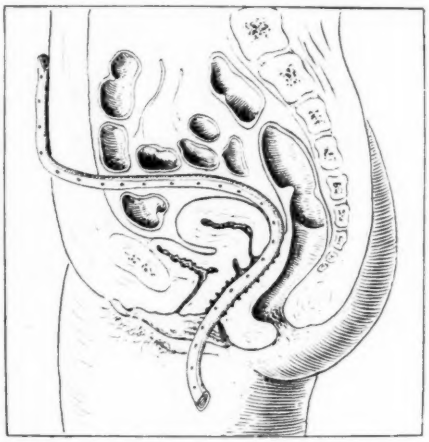

Fig. 2. Drawing showing application of drain.

and lies on the abdominal wall; the lower end proceeds through and out of the vagina. The drainage obtained by this method is very satisfactory, especially at the vaginal end. Here, to the capillarity of the drain is added both the capillary attraction of the mucous membrane of the vagina and gravity.

Drainage is so free by this method that the pelvis can be irrigated without fear of spreading the infection.

The drain is easily removed by gentle traction on the vaginal end.

DEMONSTRATION OF APPARATUS FOR THE REDUCTION AND TREATMENT OF FRACTURE OF THE FEMUR

By JAMES EAVES and PAUL CAMPICHE, M.D., F.A.C.S., San Francisco

WE are showing here a little device which we have found useful in the treatment of fracture of the femur. It is a double incline frame which was designed by us and was made by Berbert Brothers; it is adjustable to any patient—large or small—and at any angle desired. We use it in following manner:

The patient is put on a fracture-bed; from the X-rays we form an idea as to the angle of flexion of the knee most favorable for the treatment of this particular case. The inclined plane is set at the angle required; by moving the screws we give the branches the appropriate length. This can be done very accurately by trying the position with the sound leg on the plane first. When the angle and the length of the branches are considered satisfactory, we cover the plane with some strong muslin and pad it with sheet-wadding; the broken leg is then placed on the double-inclined plane.

Then, using local anæsthesia, we insert the points of our traction-caliper in the femur on both sides, just above the condyle and well outside of the articulation, and the traction is begun immediately with 10 or 12 pounds and increased in a day or two to 18 or 20 pounds. The foot of the bed is raised so that the weight of the patient's body will act as counter-extension. (The traction-caliper was designed by us after the principle of the ice-tongs, and is practically the same as the other models on the market, only it is heavier and the points being much stronger do not break so easily.)

In the following days, roentgenographs are taken in the ward or in the room of the patient with a portable X-ray machine, without moving the weights. The traction is kept up for 2 or 3 weeks, or more; after that we gradually raise the foot on pillows every day a little more until the knee is almost extended; then we incorporate the patient in a big plaster cast from the waist down to the toes; this is done with the patient in his bed and without removing the traction until the cast is dry; or especially in elderly people, when some union has begun to take place we leave the patient with his leg on the inclined plane after the weights have been removed and do not put him in a cast. Subsequent treatment is practically the same as with the other method.

The adjustable inclined plane is such a great help and makes things so simple that we now consider the caliper traction as the method of choice in the treatment of fracture of the femur. It is less troublesome and more effective than Buck's extension; I remind you that to reduce a fractured femur in a strong man, Bardenheuer, the great apostle of the extension-treatment of fractures uses 50 pounds on the extended leg whereas with a knee held properly in flexion on our plane we seldom require more than 18 to 20 pounds to achieve reduction. Therefore we use Buck's extension only in small patients and children and only in simple cases attended with very little displacement or overriding; we know that Buck's extension has given us excellent

Fig. 1. Photograph of author's double inclined fracture frame.

Fig. 2. The arms of traction-caliper are heavier than those ordinarily found in traction-caliper devices.

Fig. 3. Application of traction-caliper and double-inclined fracture frame.

results in these selected cases, but it is inadequate in serious injuries with great displacement and in very muscular subjects.

If we now compare the caliper traction method with the open reductions done by operation and plating of the femur we have to weigh very closely all the advantages and drawbacks of each method before drawing our conclusions. There is no question that the most accurate reduction and fixation is achieved only by open operation. However, experience shows that this is not at all necessary to insure good functional results. Even the old dictum that a two-thirds or one-half apposition of the broken surfaces must be obtained does not hold good any more. With the traction-caliper we have no trouble to correct the shortening, but we seldom correct the displacement at latus yet. If the bones have only one single point of contact and any interposition of soft parts is surely excluded, we can confidently expect solid union in a relatively short time. It is, indeed, a drawback of the plating operation that because the fixation is too great and does not allow even the slightest movement of the fragments the formation of callus is slow and poor; on the contrary with the caliper traction method, while the shortening and overriding is constantly prevented, small lateral movements of the fragments are possible, which greatly stimulates the growth of the callus as shown by the X-ray. We said above that with the traction-caliper we can confidently correct any shortening. There is, however, an exception to this—the comminuted fractures. The only cases we had that healed with a shortening of one-half and three-fourths inches respectively were comminuted fractures; but in these an open operation was counter-indicated, as there would have been great danger that one of the fragments, especially the middle fragment, might have been deprived of its blood supply and have died altogether, leaving a large defect in the femur shaft. Therefore we do not feel that a shortening in comminuted fractures should incriminate the caliper traction method.

Another point in favor of the caliper-traction treatment is that there is no anæsthesia necessary and that there is practically no danger of infection; and also that it does away with the long standing sinuses so apt to occur after plating operation and that keep patient incapacitated sometimes for years.

Our statistics indicate that in patients treated by operation and plating the length of treatment is 10 months on the average, while in the caliper-traction cases it is only 8 months, but we hope to do better in the future for following reasons: In all our plated cases, there was so little callus formed that we had these patients walk about in a walking Thomas splint for several months. Our fear of a weak callus has been so great in the past that we have continued this practice for cases treated by traction. However, the callus as observed in the X-rays seems so good in these cases that in the future we think we will discard the use of the walking Thomas splint. This ought to shorten materially the length of the treatment by allowing the patient to regain early voluntary use of his muscles and the motion of the knee joint.

Open operations on the femur should be reserved for late cases where traction has failed or has not been properly carried out, or in cases with interposition of fascia or muscle. In ordinary and fresh cases we consider the caliper-traction method on an adjustable incline plane as the method of choice.

IODINE PREPARATION OF THE VULVA FOR DELIVERY

By R. S. SIDDALL, M.D., Detroit, Michigan
From the Obstetrical Department, Henry Ford Hospital

FOLLOWING the observations of Semmelweiss, Oliver Wendell Holmes, and others in regard to the factors favoring propagation of puerperal fever and with the more recent developments in asepsis there has resulted a tremendous reduction in mortality from puerperal infection where proper precautions are taken. Yet, the results are far from ideal as is plainly shown by the fact that even in well regulated hospitals, where rectal examination has largely supplanted vaginal, and where faultless surgical cleanliness is observed, there is a reported morbidity from puerperal infection varying from 10 to 30 per cent, depending upon the method of observation and criteria, with an occasional death from the same cause. In such institutions there seems little likelihood that infection is spread to any extent from patient to patient by attendants, but it appears probable that we might rather look to the individual patient herself or her preparation for the explanation of a febrile puerperium. Autoinfection from pathogenic streptococci already existing in the vagina or by spread of infection from a distant focus to the uterus can be only occasional factors, at most. Nor is the gonococcus, in general experience, responsible for more than about 10 per cent of puerperal infections. In a search for the cause and prevention of the other and much larger portion we have been led to make certain clinical observations.

Recently there were published (3) the results of an experiment in this connection which had been suggested by the fact that patients who were delivered precipitately before the usual preparation could be made seemed less likely to have an abnormal puerperium. As a consequence we began to question the efficacy and even the innocuousness of the usual method of cleansing the perineum. At about this time Lankford (4) suggested that frequently the solutions used in the ordinary cleanup might well enter the vagina, thus carrying in bacteria from outside sources. The possibility of entrance of bath water into the vagina has been established (7). The question was then put to actual test in a series of spontaneous deliveries, the routine technique being followed except that the usual scrub and flush preparation of the vulva was omitted with every alternate patient, only the pubic hairs being clipped. No exception was made for vaginal examination. The occurrence of febrile puerperia was, for patients with routine preparation 16.3 per cent, for those with only clipping of the vulval hairs, 12.4 per cent (figures which are comparable with results in other clinics). J. Whitridge Williams, under whose supervision this test was made, in discussion of the subject in the fifth edition of his textbook (10) says: "Their observations, which were published in 1922, showed that the incidence of febrile puerperia was 16.3 and 12.4 in the two series, respectively, and indicated that if there was any difference it was slightly in favor of non-preparation. Although an additional series of observations gave identical results, I am not yet prepared to advocate abandoning the time-honored method of preparing the genitalia, even though I am skeptical concerning its value."

For the cleanup, which thus might theoretically be harmful rather than beneficial and which in actual test did not yield results quite so good as non-preparation, we felt justified in searching for a substitute method, which, while affording the maximum degree of sterilization of the vulva, should yet be applicable by such a process as not to be a possible agent in the introduction of bacteria into the birth canal. Obviously these conditions could be fulfilled by painting the perineum with the surgical skin sterilizing agents such as tincture of iodine (suggested by Lankford, 4), or solutions of picric acid or mercurochrome. Because of the disadvantage of the staining properties of the two last substances, tincture of iodine was selected for trial, as was stated elsewhere (6), the objectionable features of irritating after-effects and burning sensation at application being obviated by dilution and a few whiffs of nitrous oxide. Since we adopted this method Vogt (9) of Tuebingen has reported that the simplicity and reliability of iodine for obstetrics has been demonstrated. Also, Irving (2) has shown by cultures that it sterilizes the perineum at least as well as does the old scrub and flush method.

The outcome of our experiment has been so gratifying that we feel justified in reporting the results in the series which has been completed to date. The technique employed is as follows:

Upon the admission of the patient in labor the pubic and vulval hairs are clipped with ordinary barber's clippers. The perineum is then covered with a dry sterile pad only when there is much

vaginal discharge or in case of constant loss of fluid with premature rupture of the membranes, and this is for the comfort of the patient and is not an attempt to add anything to the natural and usually adequate barrier of the genitalia to the entrance of bacteria into the birth canal. Indeed, it would seem logical to expect that a perineal pad might possibly promote infection, for only slight movement is sufficient to transfer the part of the pad at the anus to a position over the vulva. The progress of labor is followed mainly by rectal touch, vaginal examination being only occasionally necessary.

Preparation for delivery is usually made just after a pain, nitrous oxide-oxygen anæsthesia being continued for the required few moments. With a diluted tincture of iodine (2 per cent iodine) the vulva, perineum, lower part of the abdomen, the inner sides of the thighs, and the part of the head in view are carefully painted. The patient is then draped for delivery with the sheet recently described by W. B. Thompson (8). For vaginal examination only the area immediately adjacent to the vagina is painted. The much shorter time required for this procedure as compared with the usual method of preparation is frequently in itself of considerable importance. Tears are repaired at once, perineal after-care is limited to that necessary for personal cleanliness (Plass, 5), and in other respects our technique does not differ essentially from that outlined in our above mentioned papers.

Of the 300 consecutive deliveries in this series 238 were spontaneous, and 62 required some type of vaginal operative interference, including the use of bougie or balloon. Of the whole group 30 patients had febrile puerperia, the criterion being a temperature elevation, or elevations, of 100.4° F. (38°C.) or above for a period of 24 hours or longer during the first 10 days, exclusive of the operative (?) reaction on the day of delivery, temperatures being taken by mouth every four hours. This is the criterion for febrile puerperium which seems to be most authoritative and is essentially in accord with the recommendations of the Congress on Puerperal Fever at Strasbourg in August, 1923. In the case of 12 of these patients with abnormal puerperia the febrile reaction was clearly due to intercurrent disease outside of the pelvic organs,—i.e. respiratory infection seven, mastitis one, and pyelitis four times, and consequently these should be eliminated from calculations. In the few cases where no explanation could be found for the fever, the cause was assumed to be puerperal infection, even though the uterus and adnexa showed no evidence of involvement. Then, in a series of 288 consecutive spontaneous and operative deliveries there were 18 patients with puerperal infection, an incidence of 6.25 per cent.

The most reliable comparison of the value of different preparations for delivery is made with spontaneous deliveries, for in these we do not have the uncontrollable factors which are present in a series of operative deliveries. In this series there were 229 spontaneous deliveries, and 9 or 3.9 per cent were followed by a febrile puerperium. This figure is in marked contrast to the results obtained in the previous tests referred to,—16.3 per cent for the usual cleanup and 12.4 per cent for non-preparation. However, it is possible that little reliance should be placed upon this comparison, for in the previous series the deliveries were mainly done by internes, while trained obstetricians attended those prepared with tincture of iodine. Moreover, a difference in personal cleanliness as a consequence of social status,—the first group was composed of dispensary and the second of private patients,—may have played some part in the different results as is suggested by studies of vulval and vaginal flora, especially the work of Fricke (1).

In Table I the results obtained in the iodine prepared series of spontaneous deliveries are tabulated in an effort to determine the effect of various factors in association with this technique, though it is realized that the number of observations is too small for definite conclusions. In this tabulation rupture of the membranes was considered to be premature when it occurred before the cervix became half dilated. The incidence of puerperal infection, with the other factors in about the same proportion, showed very little difference for normal rupture (3.8 per cent) and premature rupture (4.3 per cent). Premature rupture

TABLE I.—SPONTANEOUS DELIVERIES WITH TINCTURE IODINE PREPARATION

Membranes ruptured normally	Number Cases	Febrile Number	Febrile Per cent
Without vaginal or repair	62	2	3.2
With vaginal, without repair	9	0	0
With repair, without vaginal	76	4	5.3
With vaginal and repair	12	0	0
Total	159	6	3.8

Membranes ruptured prematurely	Number Cases	Febrile Number	Febrile Per cent
Without vaginal or repair	26	0	0
With vaginal, without repair	5	0	0
With repair, without vaginal	35	3	8.6
With vaginal and repair	4	0	0
Total	70	3	4.3
Combined Total	229	9	3.9

of the membranes before or at the onset of labor occurred 55 times (24 per cent) with no increase in the incidence of puerperal infection (3.6 per cent). When vaginal examination was done with this technique there was apparently no added danger to the patient. These observations are in direct contrast to the figures that were found with the scrub and flush preparation, as in that group puerperal infection was definitely increased in association with both vaginal examination and premature rupture of the membranes. The slight increase of infection with perineal laceration (5.5 per cent) is without definite explanation, for it could not be attributed to infection in the wound as in all the febrile cases healing was *per primam*. Perhaps during the necessary manipulation for repair pathogenic bacteria were introduced into the vagina.

An analysis of the histories in the 9 cases of puerperal infection shows the incidence of the following types of infection as determined clinically: Endometritis six times, thrombophlebitis two times, type undetermined once. Of the endometritis cases two were associated with retained membranes, one followed premature separation of the normally implanted placenta, one occurred with mastitis and there was only a suspicion of intra-uterine infection. In one of the thrombophlebitis cases there was good evidence of the onset before labor. The fever of undetermined type was a continuation of a temperature elevation which was present upon admission. We have no conclusive evidence of gonorrhœal infection in this number, and no patient was seriously ill.

When we turn our attention to the puerperia following vaginal operations, it is seen at once that puerperal infection is much more frequent, as should be expected. Of the 59 patients with various types of operative interference there were 9 with febrile puerperia, an incidence of 15.25 per cent. In Table II the operative procedures with the incidence of puerperal infection are given. A review of the histories of these deliveries shows that with idoine preparation of the vulva, as with other methods, interference with the normal process of labor exposes the woman to increased danger from puerperal infection. However, the comparatively low incidence of infection in this series would seem to indicate that, when operation does become necessary, iodine sterilization of the perineum compares very favorably with the old method of preparation.

We may conclude, then, from the evidence in this limited series of deliveries, that painting the vulva with diluted tincture of iodine offers a method of preparation for vaginal examination and for spontaneous and operative delivery which is simple and reliable.

TABLE II.—OPERATIVE DELIVERIES WITH TINCTURE IODINE PREPARATION

Type	Number Cases	Febrile Number	Febrile Per cent
Induction of labor (bougie or balloon)	9	1	11.1
Manual removal placenta	2	1	50.0
Placenta prævia (balloon, etc.)	2	0	0.0
Breech extraction	9	2	22.2
Low forceps	28	4	14.3
Mid forceps	9	1	11.1
Total	59	9	15.25

NOTE.—Since completion of the foregoing article we have delivered 200 additional patients, using the method of perineal preparation with 2 per cent iodine described above. The occurrence of puerperal infection was in close accord with the results in the first group of 300 deliveries. Also, the morbidity apparently bore no relationship to premature rupture of the membranes or vaginal examinations but showed a higher incidence in cases with perineal lacerations. Among the 500 patients in the two groups there were 47 (9.4 per cent) with febrile puerperia, but in 14 instances the fever was definitely due to some other cause than puerperal infection (acute respiratory infection, 7; pyelitis, 5; mastitis, 1; and vaccinia, 1). If these be eliminated from subsequent calculations, we have 33 (or 6.8 per cent) puerperal infections following 486 deliveries. There were 398 spontaneous labors in this number and 88 in which there was vaginal operative interference with an infection incidence of 4.5 per cent and 17 per cent respectively.

More recently we have employed 2 per cent aqueous solutions of mercurochrome or meroxyl in a limited number of deliveries with satisfactory results. A certain advantage may be claimed for these substances in that there is no pain nor burning on application. Meroxyl solutions are practically colorless, and some coloring matter must be added to show that the area to be sterilized has been covered. We have found alizarin to be fairly satisfactory for this purpose. The fact that mercurochrome stains on sheets and towels are not removed by ordinary laundry methods is a definite objection to its use.

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MEMOIRS—JOHN I. HUNTER

APPRECIATION OF DR. JOHN HUNTER

IN the sudden death of the young anatomist, Dr. John Hunter, the science of medicine has lost an outstanding exponent, a man of vision, a dreamer of true dreams. At the early age of twenty-seven, Dr. Hunter had done work of such character as to entitle him to the chair of anatomy at the University of Sydney, Australia, an achievement of which a man of any age might well be proud.

Dr. Hunter received his early education in Australia. His graduate studies were pursued with some of the eminent physiologists and anatomists of the English universities. I do not recall a man who has more brilliantly fulfilled the promise of his earlier student years.

I visualize Hunter as I saw him first in the beautiful auditorium of the University of Sydney, addressing a thousand members of the profession and medical students in a clear, convincing manner, in beautiful English, with a pleasantly modulated voice which could be clearly heard in every part of the hall. The epoch-making work which he did in connection with Dr. N. D. Royle, which so accurately related muscle tone to the sympathetic nervous system, was but one of a number of great scientific researches which he carried on. During the days our little party spent in Sydney in April, 1924, we followed the work of Dr. Hunter and Dr. Royle with the greatest interest, and were impressed with the scientific accuracy and knowledge of the fundamental sciences which were Dr. Hunter's contribution to their splendid joint effort. Whatever the ultimate practical results of this work, as an addition to pure science, it is of the greatest value. Hunter combined the physiologist and the anatomist. With the eyes of the master, he related form to function. The medicine of the next generations is becoming clear to us in this generation. We see that the remaking of medicine will be based on the fundamental sciences. As the eye goes, so goes the mind,—from the microscope to the ultramicroscope, from the colloids to the molecule and the atom.

Hunter's brilliant appearance at the last meeting of the American College of Surgeons will never be forgotten by those who were so fortunate as to be present. It was an inspiration to the medical profession of America, who now extend their sympathy to his family and friends, and to the medical profession of that great commonwealth which has the distinction not only to be the birthplace of John

JOHN I. HUNTER, M.D., CH.M.
1898-1924

Hunter, but also to claim him as the product of its training. Australia may well be proud to have produced such a man. Great Britain lives again in the scientific achievement of Hunter, of Banting, and of the other young men in her colonies who have so ably upheld the scientific traditions of the English school.

JOHN HUNTER

In the midst of life we are in Death

JOHN HUNTER is dead. The youth who won the love and admiration of all by his modesty, his charming personality, and his brilliant mentality, has slipped beyond our ken, and we are left stricken and wondering. Why should one who had the power to compel the respect and the awe of the keenest savants of our profession drop on the threshold of so promising a career? Why were so much ability and such great genius bestowed if they were to be cut short of their fruition?

To none can the shock of this untimely death come with greater force than to the Editors and the Editorial Staff of SURGERY, GYNECOLOGY AND OBSTETRICS, at whose invitation John Hunter came to America to collaborate in the presentation of the John B. Murphy Oration in Surgery before the Clinical Congress of the American College of Surgeons in New York.

During our travels in Australia and New Zealand, Dr. William J. Mayo and I were met constantly with accounts of the fame of this brilliant young anatomist. When we reached his home city, we were keen to visit him and his confrére, Dr. N. D. Royle. The afternoon we spent in their workshop in the laboratory of the University of Sydney was one of the most inspiring half days of our lives. This young professor of anatomy of far-off Australia looked into our eyes, shook our hands, and modestly but forcefully, in a too short three hours, told us the story of the vision, the experiments, and the clinical studies which resulted in forecasting a great scientific discovery. We immediately realized that we were in the presence of a master. Then this youth, with the charm of a boy and the wisdom of a sage, led us on to the stage of the great hall of the University. The six hundred students, young men and women, who were assembled greeted him with enthusiastic cheers, and it was apparent that they were a unit in the pride, the confidence, and the love they bore this inspiring and honored teacher.

Meditating upon the experiences of that afternoon, we felt that we had been in the presence of the spirit of another John Hunter, whose mantle had worthily fallen on these youthful shoulders. We realized that all of the world would be interested to share our experience, and we therefore asked this new John Hunter

to tell the story of his work to the surgeons of America at the October meeting of the American College of Surgeons.

At our earnest solicitation, the University of Sydney loaned him to America. His reception in the United States and Canada, I am sure, left no disappointment for him and his confréres, nor for those of us who had invited him. Professor Hunter and Dr. Royle met with a veritable triumph as they went from city to city, told their story, and enacted their demonstrations.

Finally the climax was reached in the presentation of the theme—formally, impressively, and convincingly—to the two thousand surgeons and their guests in the annual John B. Murphy Oration in Surgery. Those who heard and saw the masterful presentation of these theses will not soon forget the feeling of admiration they experienced. The opinion, I am sure, of those who carefully followed, listened, and judged was: "We have been witness to an epoch-making event in the history of surgery."

Franklin H Martin

The many friends of John Hunter, who were shocked by the news of his untimely, sudden death, will thank Mr. G. Elliot Smith, Professor of Anatomy of the University of London, University College, for the following letter which gives the details of Professor Hunter's last illness:

Dear Doctor Franklin Martin,— 16th December, 1924.

In reply to your cablegram which has just reached me, I can tell you in a few words the little there is to say about the terrible tragedy of poor Hunter's death. He arrived in London on 22nd November, apparently in exceptionally good health and full of energy. He threw himself at once into the business of demonstrating his work to the physiologists and clinicians in London, and gave a number of lectures, and was going to start a more formal course on 8th December. On 3rd December he went up to Cambridge, and was very busy there with informal discussions as well as public lectures. He returned to London on 6th December because he was not well. On the following day it was found that he had a temperature of 104.6 and I got our best physician, Dr. Charles Bolton, to see him, and he sent him into the hospital suffering from the most virulent form of enteric that Dr. Bolton had ever seen. His temperature remained at about 105 until the 10th December, when signs of cardiac failure showed themselves, and he died on that day. He was delirious a good part of the time, and almost unceasingly talked about his experimental work. It appears that he had been ill from 1st December, but took no notice of it; as he was so absorbed in the task of convincing people here of the truth of his results that he went about for six days after the onset of the illness without realizing that he was seriously ill. . . . The whole business is unspeakably tragic because he was certainly the most promising anatomist that we had, and I feel convinced that if he had been spared, he would have been perhaps the biggest figure in scientific medicine of the present generation. . . . Could you send to me fifty copies of the Murphy Oration (both Hunter's and Royle's contributions) for use in this country? I should like to have them as soon as possible, as I am embarking upon a course of public lectures here on Hunter and his work. With kind regards, yours very truly,

G. Elliot Smith.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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FEBRUARY, 1925

DISASTERS FOLLOWING OPERATIONS FOR RETROPOSITION OF THE UTERUS

WITHIN the last month, my attention has been called very forcibly by three cases which have occurred in my own clinic to disasters which follow operations for retroposition of the uterus.

I shall first briefly describe these cases and then attempt to draw a moral from them:

CASE 1. A woman of thirty, very anxious to have children, was operated upon by a competent gynecologist in Boston, who sewed the fundus of the uterus to the anterior abdominal wall with a silk suture. This was done some months ago. I was called to see her in a very acute attack of intestinal obstruction. She had been writhing in pain for a few hours. I made an immediate laparotomy and found the entire sigmoid strangulated and almost black, the entire loop having been caught between the uterus and the anterior abdominal wall and strangulated by a fibrous cord extending from the uterus to the abdominal wall which contained a silk ligature. This fibrous cord was removed with the ligature and after watching the intestine, wrapped up in moist pads, for 15 minutes the color improved and I decided not to make a resection, but to place the sigmoid back in the abdominal cavity. Fortunately, she went on to a good recovery.

CASE 2. Within two weeks, another young woman who had had several children, and who had been operated upon by a prominent gynecologist in Chicago, was seized with a similar attack of acute intestinal obstruction late one evening. I saw her the next morning and had her removed at once to the hospital. I did a laparotomy and found about two feet of the ileum strangulated in a band of adhesions extending from the round ligament to the anterior abdominal wall. This band was divided and removed. Although the loop of strangulated gut was a very dark, purple color it finally improved and the intestine was placed back in the abdominal cavity. She fortunately went on to a good recovery.

CASE 3. Within the past few weeks a third patient came to me who had been operated upon by a competent surgeon in Cincinnati. She had had some perineal repair work done and had had the uterus brought forward by fixing the round ligament to the anterior abdominal wall, pushing a loop of round ligament through the musculature. At the site of each operation a large hernia had developed. I operated under ethylene and found a hernia as large as a good-sized orange on one side, and on the other a hernia about the size of a lemon. The hernial sacs were removed and a careful dissection made so that we could close the wound as we do in a muscle-splitting operation for appendicitis.

The lesson of these three cases I think is evident. No surgeon has a right to perform an operation for fixation of the uterus that carries with it the dangers that developed in these three cases. I have seen in the course of my work fifteen or twenty cases of obstruction following operations for fixation of the uterus. Other surgeons must have had the same experience, and these facts must be generally known. I believe that the time has come when we must eliminate entirely from our abdominal technique operations of this type just as we have generally eliminated chloroform from the field of anæsthesia because

of the very definite risks which these operations carry with them. There is, however, a more fundamental fact which should be generally known and generally accepted, and that is that there is no logical reason for operating on retropositions of the uterus which are not associated with other pathological conditions.

Thirty years or more ago as a young surgeon I was very skeptical about the local and general symptoms which were attributed to the condition of retroposition of the uterus. I could not understand how a mobile retroposed uterus could produce symptoms any more than a mobile sigmoid which might fall backward or forward, or to the right or left. I soon found that the cases which I operated on and brought the uterus forward in the supposed normal position were not only not benefited but that many of them were made worse by the operation, and so I early discarded it as unnecessary and illogical.

A number of surgeons who have studied this problem have come to the same conclusion and yet the operation continues to be performed, and every year hundreds and thousands of women are submitted to this unwarranted procedure. The operation is not only unwarranted but it is harmful and dangerous. I know this from the fact that I have seen many women who have been made miserable from bladder and bowel symptoms resulting from plastering the uterus forward in a fixed position and from the fact that I have been compelled to operate on a number of cases of intestinal obstruction following the operation. Looking upon this problem as a piece of scientific clinical research I believe we are today in a position to state that the uncomplicated, movable, retroposed uterus produces no symptoms and that operative procedures on such cases must be emphatically condemned.

An excellent study of this subject has been published recently from the Gynecological Clinic in Giessen by Jaschke in the *Muenchener medizinische Wochenschrift*, May 23, 1924. In this study Jaschke analyzed one thousand cases of retroflexion alongside of one thousand cases of anteflexion and found that the supposed characteristic symptoms of retroflexion, i. e., increased menstrual flow, leucorrhœa, bladder distress, constipation, backache, dysmenorrhœa and sterility, occurred as frequently in supposed normal anteflexion as in the supposed abnormal retroflexion. He comes to the conclusion that the uncomplicated retroflexed mobile uterus produces no characteristic symptoms of any kind and causes no characteristic distress. Where the distress and the supposed classical symptoms of retroflexion are present these are due to complications. These complications are not limited to pelvic peritonitis and adhesions which fix the uterus in retroflexion but are often other pathological conditions in the pelvis and abdomen, lesions of the appendix and cæcum, sigmoid, stomach, kidney, etc. Jaschke gives A. Theilhaber, the Munich gynecologist, credit for having first exposed the fallacy of retroflexion as a pathological entity. For many years Theilhaber's position was not accepted, but time and scientific investigations have proved beyond question that retroposition of the uterus produces no local or general symptoms of any kind; that when symptoms are present with this condition they are due to complications.

These facts are now so clearly established that we must conclude without any reserve that the time has arrived when operations done on women for retroposition of the uterus, for this condition alone, are unwarranted, unnecessary and indefensible because of two facts: that these operations are of no benefit to the patient and they carry with them the

serious risks such as I found in the three cases which I have enumerated.

ARTHUR DEAN BEVAN.

THE GRADED ABDOMINAL OPERATION

IDEAL surgery aims at the eradication of pathological processes in the shortest possible time with the lowest mortality rate compatible with satisfactory end-results. The measure of individual resistance to disease plus operative interference and the determination of the individual recuperative powers, gauge the type of attack to be undertaken in any given instance. There are occasions in both acute and chronic abdominal crises in which a many stage procedure is highly advantageous. Procrastination in both acute and chronic processes is responsible for more unfortunate conditions and untimely sequelæ than any other one factor. The accurate individualization of patients with the proper selection of the type of operative maneuver is the highest test of individual judgment. In acute abdominal processes such as encysted peritonitis from a ruptured appendix or in certain far advanced cases of intestinal obstruction, experience has emphasized that a graded operation ofttimes is successful where a complete primary procedure obviously would have terminated fatally. Simple drainage of the abscess cavity in the first mentioned instance, and enterostomy without exploration in the second type of case, have unquestionably saved many lives.

In many conditions of the gall bladder, particularly those associated with acute infection due to obstructive cholecystitis, a simple decompression of the gall bladder tides over the handicapped individual to such an extent that secondary operations may be undertaken much more safely. In aged individuals handicapped by chronic ailments such as diabetes or nephritis, an acute cholecystitis with progressing symptoms demanding operation may not often be safely removed primarily, but once past the imminent danger of the acute process, secondary consideration may be modified to existing circumstances.

In gastric surgery examples multiply showing the advantages of graded operations in many cases of far advanced carcinoma of the pylorus or selected cases of obstruction from benign cicatrization. Peck's procedure of first doing a simple gastro-enterostomy and then deciding if the condition of the patient warrants a resection of the pylorus in one stage or in two stages, is admirable. Here the Billroth II type of operation may be completed primarily or secondarily as may seem most advantageous in each individual case. A secondary resection of the pylorus following gastro-enterostomy is a simple technical procedure frequently because the drainage of the stomach permits a recession of inflammatory processes which are kept activated by a constant passing over of the gastric content into the duodenum. At the same time the individual is permitted to increase his own resistance by the proper intake of fluids and foods.

Nowhere in the abdomen is a graded operation more advantageously employed than in cases of colonic obstruction which are the result either of malignancy, or as is frequently the case in the lower sigmoid, of diverticulitis. Local and general reactions which follow chronic colonic obstruction are such that if the process has advanced to a degree where the individual may be graded a poor operative risk, the local conditions at the site of the growth are sure to be found unsatisfactory for a single stage resection. By employing a colostomy above the point of obstruction the proximal loop of the bowel may be used for the introduction of nutritive enemata or other

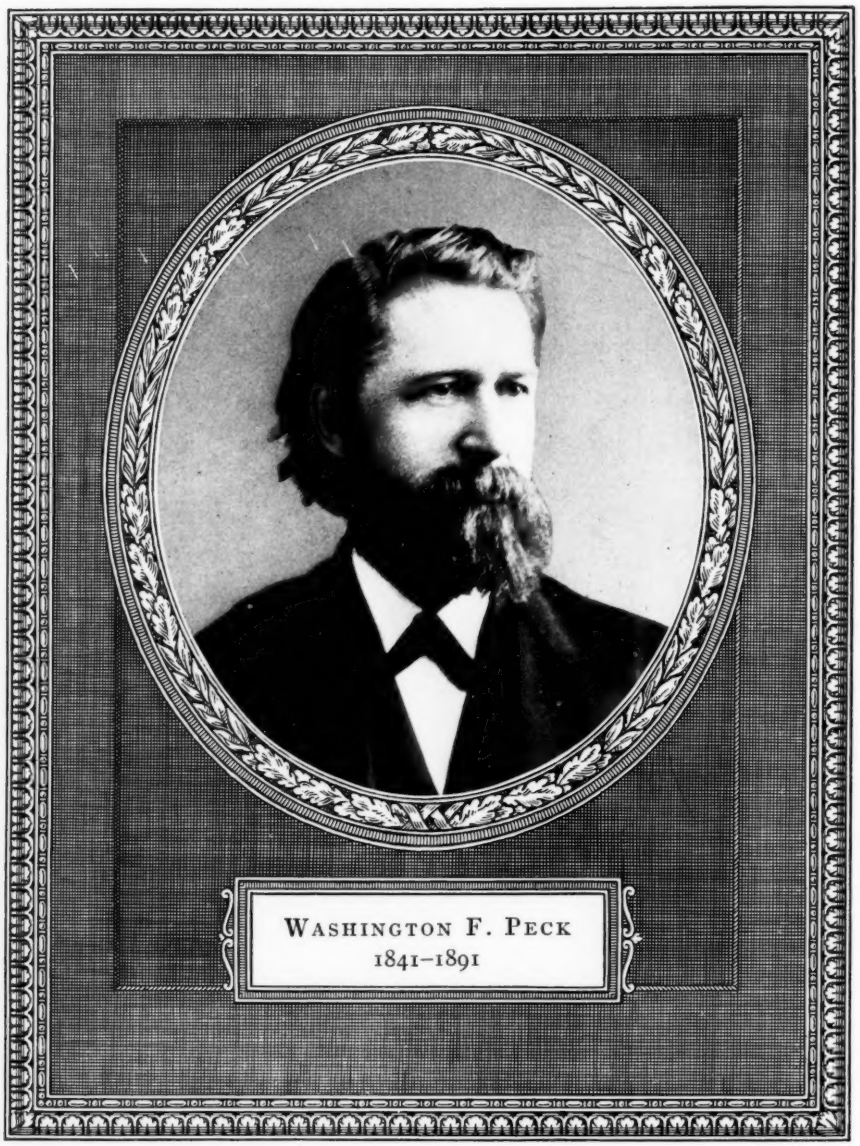
foods, while the local irrigation of the distal loop reduces the infection and improves existing conditions for a secondary operation.

Should the obstruction of the large bowel from malignancy come on acutely, as it does in 5 per cent of the cases, there is no choice except a graded procedure. The prohibitive mortality of primary resection forces one in many instances to employ a cæcostomy without an informative exploration in the hope that the immediate crisis may be weathered, and a subsequent secondary operation undertaken.

In diverticulitis of the lower sigmoid, primary resection is much more difficult technically and much more hazardous from the standpoint of immediate mortality than colostomy and subsequent resection with axial restoration of the lumen of the bowel.

Not infrequently the inflammatory process fastens itself on to the bladder and occasionally ruptures into this organ. Again localized abscesses are often present without manifesting many clinical symptoms and such a complication adds immeasurably to the danger of attack at a single stage. When the colostomy has permitted a recession of the local process and an increased general resistance, resection may be undertaken more tranquilly.

Secondary operation on the colon for malignancy may be carried out in a more radical way than a one stage resection would permit, not only because the patient's general condition is vastly improved, but the local œdema and swelling which have surrounded the growth have subsided and the promise of successful anastomosis without abscess formation or leakage is greater. Prolonged convalescence is unquestionably the most disadvantageous consideration in a graded procedure, but good judgment demands that economic conditions be disregarded if they influence or if they favor the mortality incurred or the end-results sought for. A reduction of 5 per cent in the mortality of left colonic growth has been brought about by the graded operation and is an advantage not to be overlooked. In dessicated and debilitated individuals the graded procedure is frequently indicated and may be advantageously employed, as a study of operative mortality and end-results will indicate. FRED W. RANKIN.



WASHINGTON F. PECK
1841–1891

MASTER SURGEONS OF AMERICA

WASHINGTON F. PECK

DR. W. F. PECK was born in Galen, Wayne County, New York, January 22, 1841, and died at his home in Davenport, Iowa, December 12, 1891.

Dr. Peck received a common school education and with this rather limited preliminary education, matriculated in Bellevue Hospital Medical College, from which he graduated with the degree of doctor of medicine in 1863. After a year of interne service at Bellevue Hospital, he located in Davenport and engaged in general practice. By a process of evolution he gradually entered the field of general surgery for which he seemed particularly fitted.

Recognizing the limitations of his literary and professional training and being a man of great energy and high ambition, Dr. Peck availed himself of every optunity to improve his mental equipment and his medical and surgical knowledge. The opportunities were not great and to the end of his life it could not be said of him that he was a learned man in the sense of our present day standards of surgery, but on the basis of natural endowments, self-reliance, and courage, he reached a high place.

Dr. Peck was gifted, to an unusual degree, with organizing and executive ability and early became identified with the development of local medical activities. Among his first positions he served as secretary of the county medical society, and through him this society soon reached a state of activity. He felt the necessity of an organized hospital and materially aided in the founding of Mercy Hospital at Davenport, and later Mercy Hospital at Iowa City. Up to 1869, when Mercy Hospital was organized at Davenport, all his surgical work was done in private homes, often under the most unfavorable conditions.

In 1850 a medical school known as the College of Physicians and Surgeons, was organized at Keokuk, and had by various means become recognized as the medical department of the Iowa State University. This relation was only nominal, as was so often the case at that time, but the Keokuk school could never secure substantial aid from the State, although it had a nominal recognition from the legislature. The failure on the part of the Keokuk school to secure the status of an integral department recognition led Dr. Peck, as early as 1866, to agitate a plan for the organization of a real medical department to be located at Iowa City —the home of the University—with as close a relationship as possible. With the

aid of Judge John F. Dillon, himself a medical graduate, the medical department was organized in 1868, with Dr. Peck as dean and professor of surgery.

Dr. Peck's ambition was now realized in a very substantial manner. The University had difficulties in securing adequate appropriations for ordinary purposes even, and was too poor to help the medical school in any substantial manner, and the department was obliged to depend upon student fees largely, and to a man of less determination than Dr. Peck, the undertaking would have been most discouraging. There were, however, some personal compensations. The position as head of the medical school and professor of surgery were of no little value in developing his plan of devoting himself to the practice of surgery exclusively; he soon became recognized as the foremost surgeon in Iowa and calls came from all parts of the State for difficult operations. His reputation as an organizer and as a skillful surgeon secured him the position as chief surgeon of the Chicago, Rock Island & Pacific Railway Company in 1875, a position he held to the time of his death, being the first Chief Surgeon. This position was of material advantage also in extending his influence with a large staff of subordinate surgeons. Thus we see him holding two of the most important surgical positions in the State. No class of surgical undertakings practiced at that time were beyond his reach. He early began to do abdominal operations, at a time when but few of these operations were practiced outside the larger medical centers.

In 1886 Dr. Peck visited Europe for six months' study. Here he came under the influence of Lawson Tait, of Birmingham, whose marvelous success in ovariotomy particularly influenced Dr. Peck and led him to accept Tait's views that bacteria were not pathogenic. He failed to recognize that hot water and soap were really antiseptic agents and that hot water, rapid and dextrous operative technique fulfilled the principles of Listerism. Dr. Peck returned fully imbued with the idea that Listerism was not good surgery.

This antagonism to Listerism, which Dr. Peck maintained to the end, raised much controversy and had some influence in impairing his position of leadership in surgery in his later years. Notwithstanding his avowed position in relation to pathogenic bacteria, he unconsciously carried out the essentials of modern aseptic surgery, which, together with rapid operative technique, accounted for much of his success. There is no doubt that if Dr. Peck had lived a few years more he would have accepted the theory of antiseptic and aseptic surgery.

In the days of his active surgical practice, abdominal surgery was limited largely to removing ovarian tumors—which in those days often reached enormous size—and to the Battey operation, for the removal of ovaries for painful menstruation. Dr. Peck had a goodly number of these operations to his credit. But in this he was only following the gynecological fashion of the day. In his technique he followed the usual method of using silk ligatures in tying off the stump, employing the clove-hitch. In closing the abdomen he employed rather a

novel method, of transfixing the abdominal walls with large hare-lip pins and securing the wound with heavy silk figure-of-eight about the pins. This procedure was often attended with infection of the abdominal wound and was generally painful.

Dr. Peck did not pose as an abdominal surgeon, but did the greater part of this work in Iowa. He was unusually skillful and successful in general surgery, as it was practiced during his 25 years of active practice. He was a skillful diagnostican and his opinions were generally recognized as final. He did not enjoy the advantages of the X-ray or other instruments of precision, and he had for so many years relied on the history of the patient, the result of physical examination, and the exercise of intellectual process in determining the nature of the disease or condition, his good sense, judgment and experience, that it is reasonable to believe that he would have been slow to rely on laboratory methods in diagnosis. However, it is likewise reasonable to believe that had he lived to witness the new fields of surgical enterprise that have been opened up in recent years, he would have availed himself of every method of investigation.

Dr. Peck made no important contribution to surgical literature, his work was purely clinical. As a lecturer on surgery he was impressive and interesting, so much so as to predominate over other members of the faculty. When the American Surgical Association was organized, Dr. Peck was invited as a charter member, he served also as chairman of the surgical section of the American Medical Association, and later as a vice-president.

In 1865 he became a member of the Iowa State Medical Society; in 1876, the president. The one great contribution Dr. Peck made to surgery was the organizing of the University Medical School, and it should be remembered that the successful opening of the school in 1870, would have been deferred many years in the hands of a less energetic and resourceful man. D. S. FAIRCHILD.

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD NOVEMBER 21, 1924, DR. CAREY CULBERTSON, PRESIDING

SPECIMEN OF FIBROID TUMOR OF OVARY

DR. ARTHUR H. CURTIS: This fibroid tumor of the ovary was removed, one month ago, from a patient 30 years of age. One other case completes my experience with this type of tumor, except for those fibroids which have invaded the ovary through extension from the uterus. I have wondered whether these growths are equally rare in the experience of other members of the Society.

The tumor mass, 19 by 14 by 10 centimeters, is exceedingly heavy for its size, weighing 1,246 grams. There is no evidence of remaining healthy ovarian tissue.

Until 3 years ago menstruation had always been regular, every 28 days, very free, 7 days in duration; it then changed to a 24-day type but otherwise remained the same; it was always regular. It is of interest to note that gradual cessation of function of this diseased ovary did not at all disturb the menstrual function with the possible exception of making the periods more frequent.

At the time of operation there had been no menstruation for 6 weeks and palpation of the uterus suggested pregnancy. The opened abdomen revealed this tumor of the right ovary, attached by a twisted short pedicle. The left ovary was large, grossly healthy, and contained a corpus luteum in full bloom. The uterus was of generous size, cyanotic and rather soft. In the cul-de-sac were 50 cubic centimeters of straw-colored fluid of the kind Dick and I found to be pathognomonic of pregnancy in rabbits.

DISCUSSION

DR. CARL HENRY DAVIS, Milwaukee, Wisconsin: During the years I was with Dr. Webster, so far as I can recall, he had only 1 case of large fibroid of the ovary. I have operated upon 1 patient in Milwaukee who had a leiomyoma of the ovary.

DR. CAREY CULBERTSON: I showed a large fibroid of the ovary before this Society the year before last. It was a very large tumor with a cystic center, the largest fibroid of the ovary I have ever seen. These tumors are rare. Hellman states that they are rare and gives statistics on the frequency (6 of 4,500 pathological specimens). Of course, we not infrequently see very small fibroid growths on the ovary to which we pay no attention, but reference here is to tumors of this sort which apparently involve the whole ovarian tissue.

DR. ARTHUR H. CURTIS (closing the discussion): This subject was very thoroughly covered last year in SURGERY, GYNECOLOGY AND OBSTETRICS, but there were not a large number of cases recorded. I have always supposed that there are many such tumors and that people did not report them. I believed that our experience was rare and that most of you would have had 10 or 12 cases to report.

REPORT OF A CASE OF PUERPERAL PERITONITIS TREATED BY LYMPHATICOSTOMY

DR. J. B. DELEE: Costain, of Toronto, invented an operation for drainage of the lymphatic system by opening the thoracic duct before it enters the subclavian vein. He believes it is particularly useful and, in experimental work found it almost curative in obstruction of the bowel with peritonitis. I thought that the operation had some theoretical value at least, and was very glad to have a case which offered some hope of proving Costain's contention.

A primipara about 25 years of age entered the hospital 22 days before her expected confinement, thinking she was in active labor. The pains subsided toward morning but after a chill she developed a temperature of 102 degrees F. She insisted on going home against our advice. At home, she had headaches and, as her husband said, she was "dopey" throughout, but went about her household duties. She entered the hospital 2 weeks later in actual labor. Twenty-four hours after entry she delivered herself spontaneously, with the aid of a small episiotomy. The puerperium was normal until the sixth day when we discovered a very severe infection around the stitches, an infection of the connective tissue of the perineum, together with a paravaginitis. She soon had vomiting and distention and the symptoms of peritonitis. The blood showed a pure culture of streptococcus. Then she developed a few miningeal symptoms. The spinal fluid contained 25 to 30 white cells to the field instead of 7 to 10, but no bacteria. There were no positive cerebral symptoms, only such as one sometimes sees in streptococcic septicæmia. The woman had a temperature of 105, pulse 140, and was apparently going to die.

I explained the matter to her husband, told him she was almost inevitably doomed but that there was a possibility of help by draining the lymphatic system. He consented, because it was apparent that my prognosis was correct. The patient was going into coma and already had a little pulmonary œdema. The operation was done by Dr. A. A. Straus, under local anæsthesia, without any great difficulty, except that produced by the abnormal course of the thoracic duct. Instead of entering the left subclavian, the duct emptied into the left internal jugular. The result of the operation was very positive. Within a half-hour the patient's mind cleared up and she sat up and demanded food. The drainage was very profuse but was sterile. In about 8 hours, however, coma returned and she died the next morning.

The improvement in the woman was striking. We have all seen women with streptococcic septicæmia present similar symptoms of euphoria. The amount of drainage that occurred indicates that there is a future for this operation in cases of peritonitis.

Since then we have had no cases of peritonitis, but I would like to see the operation tried in intestinal obstruction with general peritonitis, in general peritonitis following appendicitis, and also in puerperal peritonitis.

THE LOW OR CERVICAL CÆSAREAN SECTION (LAPAROTRACHELOTOMY) UNDER LOCAL (INFILTRATION) ANÆSTHESIA

Dr. Joseph B. DeLee read a paper entitled, "Low Cervical Cæsarean Section (Laparotrachelotomy) under Local Anæsthesia" (see p. 230).

DISCUSSION

Dr. David S. Hillis: My experience with this operation has also been very favorable. I am somewhat at a loss to understand why the operation has not been more generally used in this city, because I feel very strongly that it deserves at least a trial; and, after trying it, some of the surgeons have adopted it with considerable enthusiasm.

It should be remembered that the somewhat elaborate armamentarium shown here tonight is not necessary for its performance. An instrument that is needed, however, is one for retracting the lower end of the wound above the symphysis; the lower member of the self-retaining speculum found in most operating rooms answers very well for this purpose.

Dr. D. A. Horner: I would like to report an accident in one of the low cervical cases which I am sure, if it had occurred in the classical cæsarean, would have proved fatal to the patient.

The patient was a primipara, with breech presentation, and a large baby. The bag of waters ruptured sometime before delivery. On the second day after delivery we noticed a rise in temperature which kept up for a certain number of days, and then became normal. On the fourteenth day the patient passed *per vaginam* the entire line of sutures which were put into the cervix. I believe that nothing but a thin layer of fascia at the present time covers the site of the incision, a protection that would not have been afforded if the incision had been made in the fundus and the sutures had sloughed out in a similar manner. This patient is now convalescing, but if the classic operation had been done, the lochia would have provided free access to the general peritoneal cavity, and we would have had an entirely different result.

Dr. Carl Henry Davis, Milwaukee, Wisconsin: It was my good fortune to help perform the first cæsarean section done in America under local anæsthesia. My first cæsarean section was completed under local anæsthesia. For several years we have wondered why Dr. DeLee did not perform this cervical section under local anæsthesia, since it is technically better adapted to this than is the classical cæsarean section. There is not as much trouble with the patient after you get inside the abdomen from forcing out the intestines, which is the main difficulty encountered when a classical cæsarean section is performed under local anæsthesia. Furthermore, when ether is used, bleeding is considerably greater than when local anæsthesia is used. From every point of view it would seem that a local anæsthetic is particularly well adapted to this operation.

There is some question as to whether we gain anything by trying to do a major abdominal operation under local anæsthesia without combining it with gas and oxygen analgesia. Such an analgesic relieves the woman of a good deal of mental strain. The combination however does increase the cost of the anæsthetic. I trust Dr. DeLee will try out a long series of cases in which he gives a gas-oxygen mixture with at least 20 per cent oxygen, keeping the patient in the stage of analgesia, and that he will then compare his after-results with those in which he does the operation entirely under local anæsthesia.

Regarding the injection of morphine and scopolamine immediately after the baby has been extracted, the probabilities are that the combination will not give very much relief during the remainder of the operation. But it will be of benefit to the patient during the hours immediately following the operation. May I suggest that you follow a series of cases using heroin instead of morphine? It is said that morphine is more apt to cause discomfort after operation than heroin. The same applies to the use of an opiate during normal labor. If morphine has been given within a half-hour or an hour of delivery, there is considerable difficulty at times in getting the infant's respiration established. If heroin is used there is usually little or no difficulty. I am now using heroin, $^1/_{12}$ grain with hyoscine, in the first stage of labor rather than $^1/_6$ grain of morphine.

DR. C. S. BACON: I should not discuss the paper, because I have not done the low cervical operation, nor have I done any operation under local anæsthesia. Though there are times when local anæsthesia is desirable, I doubt whether it will ever become popular. It requires a very good technique, which all operators cannot have; and it requires a man with a good deal of hypnotic power to convince the patient that she is not suffering. With the progress that is being made in the study of general anæsthesia, I am inclined to believe that it will be useless to perfect a technique in local anæsthesia that may be soon obsolete.

I have seen a few low sections, and of course I know that the operation can be done and done very well. However, in regard to the lessened liability of peritoneal infection in the low operation, I believe Dr. DeLee is perhaps not quite accurate in the picture in which he showed the spreading of the infection. You remember that infection from the classical section is shown to spread all over the peritoneum while infection from the low section did not reach the peritoneum. In the transperitoneal operation, however, the peritoneum, of course, has been opened. I cannot see why the infection cannot spread if it gets outside the uterus into the entire peritoneal cavity. That picture might apply to the extraperitoneal operation but that was not the operation that was described.

In the old days of the classical cæsarean section, we used to be very careful not to get down into the thinned out lower uterine segment. We wanted a good thick bed of muscle to bring together, so as to prevent seepage and so as to make a good union. If, on account of very delayed labor and a high contracting ring, we got down into the thin part of the uterus, we were always more afraid that we would not make as good a closure. I am not convinced that the closure in the lower uterine segment is better; in fact, I doubt if it is quite as good, as closure in the thicker part of the muscle. I would question whether it is well ever to put into the uterine muscle a continuous suture. It seems to me that that is an error. It loosens up because of the contraction of the uterus and you do not get as good a union. I believe that the muscles of the uterus should always be closed with interrupted sutures, and I am not sure but one layer well applied is as good as three. Then a continuous suture can be used for the center layer.

DR. BERTHA VAN HOOSEN: I do not believe that Dr. DeLee stressed enough the great difference in the convalescence of patients with a low and those with the classical cæsarean section. A patient undergoing the low cervical operation does not have the trouble that a patient undergoing a high cæsarean section has. Jellett's latest textbook gives very little space to the low cæsarean operation. He says that there are many objections to it. First, it leaves great areas denuded of cellular tissues; second, it requires more skill; and third, the bladder and ureters are in great danger. Polak in his latest book dismisses it with the statement that it has not found any favor in America.

I do not do very many cæsarean sections. The reason is that I am a great believer in pubiotomy.

In the low cæsarean operation, I use the following technique:

After opening the abdomen a vein is seen that runs across the cervical portion of the uterus; sometimes it is very large. About half way between this vein and the attachment of the peritoneum to the uterus I make an incision through the peritoneum, and then at one end of the incision I plunge in a knife transversely through the tissues and separate them with two fingers. The incision being in the direction of the cervical fibers cuts very easily. It is impossible to tear down into the bladder, up into the uterus, or to the sides. One hand is placed behind the child's head and if the occiput is up, the head is extended and it slips right out from the pelvic cavity. If the head is face up, the hand is placed under the occiput flexing it. It is not necessary to put in forceps. The incision is closed with a double chromic figure-of-eight suture. These patients have a prompt and easy recovery.

DR. W. H. RUBOVITS: If it is possible to perform an operation under local anæsthesia we should do so. For this reason I have made an attempt to learn the technique and to carry it out in a small number of cæsarean sections of the laparotrachelotomy type. In my cases, I sent for the anæsthetist to be ready to administer gas, but this has not been necessary. My greatest apprehensions following the cæsarean operation were in those cases that were unfortunate enough to acquire pneumonia following ether-anæsthesia. I should hesitate to recommend its routine use but I feel a sense of security in knowing I can use it and use it successfully, especially in cardiac or nephritic cases.

Regarding laparotrachelotomy, my experience has been very striking. When I first heard of it I was eager to learn the technique; and after seeing Dr. Cornell do it, I found no difficulty in adopting the Chicago Lying-In technique. My experience has been about as follows: At the Chicago Lying-In Hospital I have never had a temperature of over 100 in a single case, except in one case that developed bronchopneumonia from an ether-anæsthesia. In the patient with pneumonia, recovery was very prompt after the pulmonary symptoms cleared up.

I am unfortunate in coming in contact with so-called neglected cases in which the membranes have been ruptured for hours or those in which vaginal examinations have been made and in which some fever and leucocytosis are present. I have in mind the cases in which the choice was either to do a craniotomy on a living child or a cæsarean section. In a rather large series of such cases I have done cæsarean section. I have had temperatures as high as 107, and a pulse as high as 192, but all these patients have recovered. I now feel absolutely certain that a high incision in the uterus would not have been followed by as large a percentage of

recoveries as followed in my cases. I have had 15 infected cases followed by suppuration and they all recovered.

In regard to the little instrument Dr. DeLee described to control bleeding, I made that in response to a need in a case I operated on a few months ago at the Lying-In Hospital. As I exposed the uterus, the whole lower uterine segment seemed to be a mass of these sinuses. I could not see clearly enough to extend my incision because of the blood. I had to clear the field by means of a suction apparatus, which took several minutes, during which time the patient lost a considerable amount of blood. I made these clamps and they are useful especially in cases in which we encounter considerable oozing.

DR. J. B. DELEE (closing the discussion): I think we will agree that if it is possible to do the operation under local anæsthesia it would be desirable. Dr. Horner forgot to mention that his patient was one of the pneumonia cases referred to; that woman within 24 hours had a temperature of 102, and a pneumonia developed, and from the pneumonia she got an infection at the site of operation. In my case, the woman who died was a little Mexican who developed pneumonia in the left lung within 12 hours. There was a patch about the shape of a kidney that lay on top of the diaphragm. The autopsy was made by Dr. H. G. Wells. In pulling down the left lobe of the liver from the diaphragm, he found on the under surface of the diaphragm another similar patch showing where the infection had gone straight through the diaphragm into the peritoneal cavity. There was a stream of pus that passed from the under surface of the diaphragm down the under surface of the colon to the wound. Dr. Wells pointed out that the infection began in the lungs, passed through the communicating lymphatics in the diaphragm, and wandered down into the field of operation—a spot of least resistance. Experiences like these convince me that a great many of our postoperative wound-infections are due primarily to infection in the lung. That is one of the main reasons I want to get rid of a general anæsthetic. I had hoped that some one would tell us more about ethylene in cæsarean section.

Dr. Davis spoke about heroin. Williams was here a year ago and told me about heroin. We tried it, but could not see any advantage over morphine.

Dr. Evans came out in his editorial column a short time ago with the statement that heroin should be banished from the hospitals as habit-forming and dispensable.

Dr. Bacon is very complimentary in thinking I am a disciple of the great Mesmer; but there is no hypnotism about it; I simply sit down and talk very enthusiastically to the women about the advantages of local anæsthesia. It may be a form of suggestion, but anyway, they do not suffer pain. If they did, they would say so when they wake up. I asked a woman on whom I operated yesterday whether she had pain and she said no. I had another woman who complained of her back, shoulders, and abdomen. The next day I asked her which hurt her most and she said her back, the shoulders next, and her abdomen least. She bore out the experiences I had collected during operations.

I did not intend this paper to be an argument for or against the low or cervical cæsarean; I merely wanted the discussion to develop the merits or demerits of local anæsthesia. However, Dr. Rubovits and Dr. Bacon, one for and the other against, have brought up the differences between low cervical and the high or classic section. The main safety in the former lies in the location of the opening in the lower uterine segment away from the contracting portion. The constant grinding on the line of suture destroys the apposition, and leakage of the lochia often results. The cervix is quiet and the wound being at rest, unites more securely; if infection occurs, it is under the bladder away from the general peritoneal cavity and easy of access.

Dr. Bacon is right about the spread of the virulent infection. In cases where there is an invasive streptococcic infection of the uterus, it is going to go through, no matter how you sew it up. It will cause death even with an intact uterus. However, most infections are not virulent or streptococcic; they are milder, producing local suppurations which are not dangerous except when they break into the general peritoneum. There is no doubt that the method of suture recommended will prevent infection much better than when the opening is up in the fundus. That has been proved so often that there is no discussion. How has it been proved? By the results. At the Lying-In Hospital while we were doing these operations we also did 128 classicals. Of 128 classicals done on the same kind of cases, 7 have died. Out of 353 laparotrachelotomies only 2 have died, 1 of them of pneumonia and the other of peritonitis. I reported that case a year ago. The woman weighed 270 pounds; her blood-pressure was 208—120. She had been in labor 4 days when I saw her. She was a Catholic and was very anxious for a living baby. At the operation, I punctured the bladder but sewed it up right away and do not believe it had any relation to the after-history of the case. She developed a peritonitis which was not recognized by the attending surgeon—it was a consultation case—and when I saw her, there was a full-fledged peritonitis. I have always felt that if the peritonitis had been recognized and drainage instituted, that woman might have been saved. When you can do 353 cervical cæsarean sections on all kinds of cases with only two deaths, it speaks well for the method. These cases were not all elective. A few of them were infected, many had been in labor 3 or 4 days, on a good many vaginal examinations had been made, and in 2 forceps had been applied without success. Two I operated on myself after having started to make Duehrssen's incisions. We do not do classical cæsarean sections under

those circumstances. In spite of these conditions we had a low mortality.

Dr. Van Hoosen stressed the wonderful recoveries these women make. Often they have a little vomiting, but nothing like that in the old classical operation. In 26 per cent of our cases there was vomiting. I do not mean that the vomiting occurred after peritonitis symptoms developed. We have adhesions after the low cervical operations for the second and third time, and we sometimes, though rarely, find adhesions as big as those which followed the old classical. I do not remember ever having done a second classical operation without finding adhesions from the first one.

Kehrer, in 1881, advocated the procedure Dr. Van Hoosen proposes, and I think Tweedy does it even yet. In the development of the operation this transverse incision had been used by Frank in 1906. It was given up because of the tendency to hæmorrhage from the big vessels in the broad ligament, which is very difficult to control. In doing a classical cæsarean section some years ago, my patient had a terrific contraction of the uterus. The child was ejected into the abdomen and the opening into the fundus extended straight down behind the bladder, then to the right into the base of one broad ligament. The woman had insisted that the uterus should not be taken out. The hæmorrhage was very severe and I could not stop it by ordinary means. Finally, when the woman's pulse was 160, I packed the base of the broad ligament under the bladder with a small laparotomy sponge. I then sewed the bladder peritoneum over the sponge and closed the abdomen. I packed the uterus and vagina and put sandbags on the belly. Five days later I pulled down the cervix, made a little transverse cut between the cervix and the bladder, entered the cavity under the anterior cul-de-sac, pulled out the gauze, put in a drain, and the woman recovered. The incision was in the region in which a transverse incision of the uterus, if it tore, would go. If I had to do it again I might take a big piece of omental fat or a piece of fat from the abdomen and sew it down onto the bleeding area.

The loss of blood at the operation is really very much less than one would expect, less than in a normal labor case; and even when considerable hæmorrhage is present, the total amount of blood lost is very little comparatively. We are inclined, as a general rule, to underestimate the amount of blood a woman loses at labor.

I wish you would try this low cæsarean operation and after you have done so I know you will be as enthusiastic about it as I am.

Regular Meeting Held March 21, 1924, Charles S. Bacon, Presiding

Dr. Gustav Kolischer read a paper entitled, "The Modern Theories of Electricity in Their Bearing on Roentgenology" (see p. 271).

DISCUSSION

Dr. Joseph L. Baer: Dr. Kolischer has presented a thoroughly understandable explanation of the physics of X-ray therapy, something with which many of us who are using radiotherapy are not too familiar. Until recently research work in deep X-ray therapy has been directed entirely toward the investigation of the physics involved. As a matter of fact an exact formula of physical principles has been worked out as a basis for the further development of deep X-ray therapy.

I believe the time has come for us to recognize that this work must be approached from a biological point of view as well. The truth of this assertion is borne out by clinical observations, for example: In myomata of the uterus the direct action of the X-ray on the tumor tissue is negligible; chief emphasis must be laid on the changes produced in the ovarian hormones. The problem from the biological point of view is the determination of a physiological dosage that will produce a therapeutic effect on tissue with the least functional impairment of the ovarian cells.

In other words not only must the physical measurement of the dose be determined, but also the degree of specific reaction of the cell groups under consideration.

X-ray therapy is to be based upon the quantitative selectiveness of the cells and not upon any qualitative selectiveness. There is no living cell that could not be damaged and eventually destroyed by the action of a sufficient quantity of X-ray. The secreting epithelium of the sex organs, testes as well as ovaries, can be destroyed by minimal quantities of absorbed X-rays.

It must be understood, however, that there is no such thing as a biologically uniform ovarian dosage.

While all the details of the reaction of the ovarian cells are not worked out, the following may be stated:

There are individual differences, which however, are only slight. Variations dependent upon the age of the patient are more pronounced—a younger woman will regain the menstrual function more quickly than older ones; and lastly, the follicles have a variable radiosensitiveness, according to their maturity, the younger cells being more easily influenced than the older ones.

A uniform ovarian dose is such a quantity of rays as will destroy all the ovarian follicles and cells under all conditions. Electrophysically speaking this corresponds to about one-third of the skin erythema dose.

Another important biological consideration is the effect of X-ray therapy upon the general condition of the patient—changes in the blood picture, and disturbances of the mental and psychic equilibrium should receive most careful observation.

As to X-ray therapy for cancer of the uterus, a careful perusal of the pertinent articles and discussions at Gynecological meetings would seem to justify the conclusion that the final results of radiotherapy do not quite equal those attained by the extended vaginal and abdominal operations.

Among the various theories propounded as explanations of the therapeutic action of X-rays on cancer, it is now pretty generally accepted that a selective specific action on the cancer cells cannot be demonstrated. All the changes in cancers that are ascribed to the influence of the therapeutic rays are observed in malignant tumors that have never been rayed, being merely the retrogressive metamorphosis which occurs regularly in malignant growths.

The characteristic effect of the rays is only in the extent of these changes. It differs from spontaneous disintegration only quantitatively and not qualitatively.

The most important feature of radiotherapy here is the destruction of the carcinoma cell. The connective tissue plays an important rôle in the definite elimination of the cancer. There is no proof of a direct stimulation of the connective tissue cells by X-rays, but it may be assumed that the activity of these cells is increased by the products of disintegration of the cancer cells.

The importance of biological criteria is further demonstrated by the fact that up to the present time no physical method is available for exact measurement of the quantity of rays absorbed in the body.

The erythema dose is still the only guide. For deep therapy the gauge is the medium erythema dose, which is not dangerous, for it represents the safe upper limit for the quantity of rays. I may say that a method being evolved by Dr. Arens of the Michael Reese Hospital comes close to a solution of the problem of the exact physical measurement of the rays absorbed in the body.

The unfavorable results produced by modern high voltage apparatus must be mentioned. While it is possible to protect the skin thoroughly serious damage may be inflicted upon the internal viscera resulting in deterioration of the whole system, and upon the structures underlying the skin resulting in the so called massive fat necrosis.

These sequelæ are very insidious, frequently not showing themselves until several months after the treatment. Hence the risk in the pre-operative raying of operative cases.

To sum up, it would seem that improvement in the possibilities of radiotherapy will require the best efforts of the physicists and the cooperation of the physiologists and biologists.

Dr. Sydney Schochet: Is it possible to interpret the way in which any given cell will act upon an enzyme? That brings up a very basic question,—the composition of water. Until we find out the composition of water it seems we are groping in the dark. Water is certainly not H_2O, for if it were its boiling point would be -70 and its freezing point -300. These are basic points in the effect of X-ray and radium on tissues.

Dr. Gustav Kolischer (closing the discussion): When high power apparatus came into use many of us were led to believe that these came close to the solution of the cancer problem. What we know is this, that so far it is doubtful whether there is any improvement in the therapeutic results. One thing is absolutely certain, the danger is increased with the introduction of the high power machine. While we are being asked to believe that by using enormous amounts of rays and that by filtering out all the soft rays we are able to protect all the tissues in the body, experience has shown that that is not the case. In fact, the destruction Dr. Baer mentioned within the body could be more dangerous than the damage we inflicted in former years by careless screening off. We do not know so much at the present time about the chemistry of the cells. We know that certain cells will be destroyed by the X-ray, while others will be damaged but may recover. We know that the great danger of any X-ray therapy is that it may destroy important organs, especially those secreting organs, the endocrine glands. While some of these changes may be temporary, it is now acknowledged that they may be permanent to such an extent that life may become extinct. Many changes that spontaneously occurred in any malignant tumor were ascribed to the action of the X-ray. There was nothing characteristic in these changes. In other words, the X-ray is not a specific against cancer. The reports from reliable sources show that final results of X-ray treatment are not quite as good as the operative X-ray treatment of cancer of the uterus is less dangerous than the modern operation as introduced by Ries. This factor may influence a man to risk the possibility of fewer cures with no primary mortality, which practically can be guaranteed with rational X-ray treatment in cancer of the uterus. There is one case in the literature in which the woman was rayed for a cancer of the uterus. Not only was she cured of the cancer but about eighteen months afterward she gave birth to a healthy child. It is possible that the preservation of the life of the patient and the functions of the organs, may outweigh the lower percentage of definite cures. That, of course, is a question that cannot be answered now. It must be answered when we have seen the results of many years of work. Why X-ray in certain instances absolutely fails and in others brings about results which can be considered actual cures we do not know. We know one thing which must be emphasized—the dangers of excessive X-ray therapy are so great that it begins to be questionable whether this modern high power apparatus does not destroy more lives than it saves. The occasional case in which the whole abdominal wall is necrotized tends to make us realize the enormous danger of the high power apparatus.

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED J. BROWN, M.D., F.A.C.S., Omaha

WILLIAM BULLEIN'S BULWARKE OF DEFENSE AND DIALOGUE

WILLIAM Bullein was an English physician, botanist, and ecclesiastic of the middle of the sixteenth century to whose ill fortune we are indebted for a most interesting book. He was born on the island of Ely during the early part of the reign of Henry the Eighth and died in London in 1576. His early education was gained either at Oxford or Cambridge or possibly at both. Later he studied for the ministry and for four years held a rectorate in Suffolk. He practiced for a time in Durham and then moved to London where he attained considerable reputation.

In 1548 he published a book which was called *The Government of Health* which was reprinted ten years later. In this reprint he promised to publish another book in a year, referring to his "Bulwarke." This he wrote, but the copy was lost in a shipwreck. In the meantime William Hilton, a brother of Sir Thomas, the Baron of Hilton, to whom *The Government of Health* was dedicated, brought against Bullein the charge that he had murdered one of his patients. This kept Bullein under surveillance for a time, and then the accusation failing, Hilton had him imprisoned for debt. He was also later found not guilty of this charge and freed. Bullein naively says in his introduction to the reader "And being thus in Pryson, me thought I had not only convenient tyme, but also a quiet conscience, to travel, in renewing my late Booke, or lost Copy, whych in deede, I am not able to finyshe, being prevented wyth so many Troubles, and Lets of my sayd Enemy, whose doings at large, I commit to sylence, least I should seeme to wryte a Story of Tragedy, or else a description of hys folly, in the place of Phisicke, no lesse also can I, but declare some cause of my let, and why my Booke came not forth ere thys tyme, according as I had promysed. But blame mee not, good Reader, although I put hym in my Booke, whych would have put me from thys lyfe. And thys Booke whych I have done, Gentle Reader, take it in good part, I pray you, for that is my desyre." The "Bulwarke of Defense" was finally published in 1562 and reprinted in 1579 "At London by Thomas Marshe, dwellinge in Fleetestreate neare unto Saincte Dunstanes Church."

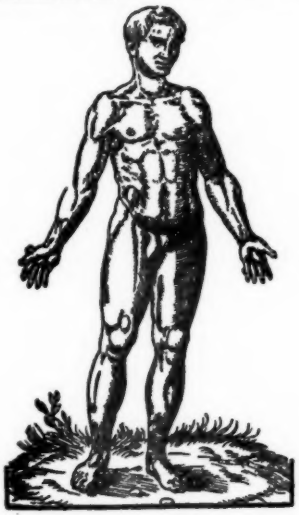
The lay literature of the time frequently used dialogue as a means of expression and Bullein borrows this method in his surgical treatise and uses it well. The sick man and the surgeon carry on a conversation regarding various surgical conditions, principally inflammatory diseases of different forms and the treatment of wounds.

In the first part of the dialogue the surgeon tells the sick man what surgery is and what the surgeon should be. It contains a diatribe against untrained and irregular practitioners. Some of these he characterizes "like as the swarmes of vagabound Egyptians." And says they travel from town to town "with a box of salve, and cases of Tooles" and when they can get nothing else: "Then fall they to Palmestry, and telling of fortunes, dayly deceiving the symple." He speaks also of soft surgeons and says "You say the truth. Even so, soft chirurgians make foule soares, sweete woordes are pleasant to women and yonge children: but playne true tales, oughte to bee amonge men of knowledge, without curious cyrcumstau(n)ce, or Rhetoricall coloures." He defines surgery as an art rather than a science and divides it into two parts, the first "Theorica" and the second, dependent on the first, "Practica."

Bullein's characterization of the requirements of a surgeon are so good that even though it will practically exclude discussion of his text, I am going to put it in for it is worth reading and in surgery practically the only thing new that he stresses is draining abscesses at their lowermost point by a half-moon incision.

"Eight things or propertyes of a good Chirurgian. He must begin first in youth with good learning, and exercise in thys noble arte, he also must be clenly, nimble handed, sharpe sighted, pregnant witted, bolde sprited, clenly apparayled, pytefull harted, but not womanly affectionated to weepe or trimble, when he seeeth broken bones, or blouddy woundes, neyther must hee gieve place to the cry of hys soare pacient, for soft Chirurgians maketh fowle soares. Of the other syde, he may not play the partes of a Butcher to cut, rend, or teare the body of man kinde. For although it be frayle, soare, and weake, yet it is the pleasure of God, to call it hys Temple, hys Instrument, and dwelling place, and the Philospher doth call it Orbiculus, that is a little world." He ends the paragraph with the quotation from Galen which is as true today as it was in Galen's time. "That is, nature is ye worker, the Physicion is but his minister. Therefore the Chirurgical Physicion, is Natures Servaunt."

Forſooth that is well ſeene: therfore let me heare the tyme wel, ſaid
my part: I would haue to haue my hearing wholy you be ye
ſpirit of helpe and helpyng.



Chirurgi.

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REVIEWS OF NEW BOOKS

FIVE volumes of this work[1], an encyclopedia on children, as the editor practically refers to it, have now appeared. Such a term is well applied. It is not and could not well be a System of Diseases of Children and be at all complete for the student of pediatrics or as a reference of value to the general medical professor. To fulfill its title adequately, the single term pediatrics, it must include not only a proper amount of space devoted to the diseases of children, but also to the broader aspect of all those factors from its conception to adult life which go to contribute to our porper understanding of the child, sick or well. This has been done thoroughly and adequately within the limits of space permissible in keeping with the time the average man has to devote to reference reading.

The volumes consist of a collection of monographic treatises. One hundred and forty authors have contributed to the work. No attempt has been made to limit its scope to medical conditions only, but a complete system of pediatrics, including every branch of the medical specialties is represented in this imposing list of authors. Most of the treatises are written, if not by the foremost authority on the particular subject, at least by one who is well qualified to do so.

The first volume begins logically with a history of medicine, limited to references to the child from ancient to modern times, written by the foremost medical historian of America, Fielding H. Garrison, M.D. He honors by a brief sketch of their lives and accomplishments, those men who have brought pediatrics to its proper level in the medical sciences.

Volumes i and ii are devoted to heredity, anatomy of the child, growth and development, metabolism, physiology and hygiene, mortalities, examinations, treatment and prophylaxis, the newborn and premature, milk and feeding, disorders of the metabolism, deficiency disease and the constitutional diatheses. The rest of the work is then a treatise of medical and surgical conditions, divided largely into systems and regional descriptions. To quote the editor in the preface, "In addition to the discussion of the internal diseases of children, subjects of surgical interest have been introduced, because after all a child who is sick may require medical or surgical treatment or both, and a well trained physician not only desires but is compelled to know when surgical treatment is indicated and the manner of its application."

The work surely is a distinct contribution to medical literature and of value to the student as well as a reliable reference for anyone treating the child, whether pediatrician or not. It does credit to American pediatrics and American pediatricians.

G. N. KROST.

[1] PEDIATRICS. Edited by Isaac A. Abt, M.D. Philadelphia: W. B. Saunders Company, 1923.

SINCE the first edition (1906) of this important contribution to the study of cancer of the breast, a new epoch of intensive investigation of cancer has been initiated. Perhaps the greatest impetus to the "cancer problem" has come through the general improvement in methods of treatment by a more disseminated use of radium and X-ray, and as might be expected, over-enthusiasm has caused much needless suffering and loss of golden opportunity for cure to some cancer patients as a sacrifice to distinct forward strides in the sum total of general benefit. Since most unnecessary tragedies in the treatment of the patient afflicted with cancer spring from a lack of knowledge of the pathology of cancer and since the literature of the last few years has been most prolific on the general and specific questions of methods of treatment, the second edition[2] of this valuable contribution to the study of the morbid anatomy of cancer is most timely. While every clinical worker in cancer may not agree with Handley, no one can read with care his accounts of his painstaking search for the pathways of the dissemination of the disease without increasing the reader's knowledge and stimulating his interest in pathological processes. It is hardly necessary to mention Handley's tremendous contribution as ably set forth in the first edition of this book. The permeation theory for dissemination of cancers of the breast was so well presented in the previous edition and has been so favorably accepted that nothing could be added. The new chapters in this second edition discuss radiological treatment in its most recent forms, recurrence and its operative treatment, Paget's disease of the nipple, lymphangioplasty, and injury as a causative factor. The chapter on natural processes of repair in carcinoma has been rewritten and is of absorbing interest. Deductions drawn from observations cited in this last chapter lead the author to assume a hopeful attitude toward therapeutic problems and to emphasize the importance of clinical research as well as research in the laboratory.

The literary style of the author is concise, clear, and convincing. The text is not burdened by an excess of irrelevant illustrations; however, diagrams, photographs, and reproductions of microscopic pictures are used to clarify a description or to support an argument, and the method of radical extirpation of breast cancer as advocated by the author is clearly and freely illustrated.

Every laboratory worker, every surgeon, and especially every radiotherapist engaged in cancer work should be familiar with this book. The reviewer can only express his admiration for the author and gratitude to the publisher for bringing again this valuable work before the profession.

ELLIS FISCHEL.

[2] CANCER OF THE BREAST AND ITS TREATMENT. By Sampson Handley, M.S., M.D. (Lond.), F.R.C.S. (Eng.). 2d ed. New York: Paul B. Hoeber, 1922.

THE small volume epitomizing the present knowledge of any of the so-called specialties of medicine is one of the best methods by which the student, general practitioner, and even the specialist may gain information in condensed and easily assimilable form.

The second edition of *A Manual of Gynecology and Pelvic Surgery; for Students and Practitioners*[1] by Skeel is offered with this indication in mind and the object desired is well attained. The volume is essentially practical and reviews the accepted methods in use today. Controversial points are not stressed. The author's opinions are given and for further information the reader is referred to standard references which are well selected to give much more detailed and complete information. The illustrations are semi-diagrammatic rather than artistic and are well chosen to illustrate the points intended.

More than all the book is well written and is understandable. The English is good and the author conveys his meaning clearly, in concise and unmistakable terms. The essential points of gynecology are covered and the volume is a distinct addition to surgical literature which will repay careful reading.

ALFRED J. BROWN.

[1] A MANUAL OF GYNECOLOGY AND PELVIC SURGERY; FOR STUDENTS AND PRACTITIONERS. By Roland E. Skeel, M.D., A.M., M.S. Philadelphia: P. Blakiston's Son & Co., 1924.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

BASAL METABOLISM IN HEALTH AND DISEASE. By Eugene F. DuBois, M.D. Philadelphia and New York: Lea and Febiger, 1924.

BIOLOGIE UND PATHOLOGIE DES WEIBES; EIN HANDBUCH DER FRAUENHEILKUNDE UND GEBURTSHILFE. Edited by Joseph Halban and Ludwig Seitz. vols. ix, x, xi. Berlin and Vienna: Urban and Schwarzenberg, 1924.

MEDICAL RECORD VISITING LIST OR PHYSICIANS' DIARY FOR 1925, rev. New York: William Wood and Company.

LE PANCREATITI. By Dott., Domenico Calzavara, M.D. Bologna: Poligrafici Riuniti, 1924.

CONTRIBUTION À L'ETUDE CLINIQUE ET EXPÉRIMENTALE DES TROUBLES VASO-MOTEURS "RÉFLEXES" D'ORIGINE TRAUMATIQUE. By D' F. Albert. Liége: H. Vaillant-Carmanne, 1924.

UROLOGISCHE OPERATIONSLEHRE. By Dr. Fritz Voelcker and Erich Wossidlo. Leipzig: Georg Thieme, 1924.

INFANTILE PARALYSIS IN VERMONT; a Memorial to Charles S. Caverly, M.D. Vermont: State Department of Public Health, 1924.

DAS PNEUMOPERITONEUM IN DER GYNAEKOLOGIE. By Dr. Med. et Phil. Hermann Wintz and Dr. Rudolf Dyroff. Leipzig: Georg Thieme, 1924.

DIE ROENTGENBEHANDLUNG DES MAMMAKARZINOMS. By Dr. Med. et Phil. Hermann Wintz. Leipzig: Georg Thieme, 1924.

LECTURES ON PATHOLOGY. By Ludwig Aschoff, M.D. New York: Paul B. Hoeber, Inc., 1924.

MEDICAL ANNUAL. Forty-Second Year 1924. Bristol: John Wright & Sons, Ltd.

BIRTH, STILLBIRTH, AND INFANT MORTALITY STATISTICS. Washington: Government printing office, 1922.

MANUAL OF THE DISEASES OF THE EYE; for students and general practitioners. 11th ed. rev. By Charles H. May, M.D. New York: William Wood and Company, 1924.

DIE RAUCHENDE FRAU. By Dr. R. Hofstaetter. Leipzig and Vienna: Hoelder-Picheler-Tempsky, 1924.

ÉTUDE DU SYNDROME DOULOUREUX DU COLON PROXIMAL. By Oscar Mercier. Paris: Amédée LeGrand, 1924.

RACE HYGIENE AND HEREDITY. By Hermann W. Siemens, M.D., translated and edited by Lewellys F. Barker, M.D. New York: D. Appleton and Company, 1924.

A PRACTICAL MEDICAL DICTIONARY. By Thomas Lathrop Stedman, A.M., M.D. New York: William Wood and Company, 1924.

THE PRINCIPLES OF ORTHOPEDIC SURGERY FOR NURSES. By James Warren Sever, M.D. New York: The Macmillan Company, 1924.

GYNECOLOGY, MEDICAL AND SURGICAL. By P. Brooke Bland, M.D. Philadelphia: F. A. Davis Company, 1924.

EVERLASTING LIFE; A CREED AND A SPECULATION. By William W. Keen, M.D., LL.D. Philadelphia: J. B. Lippincott Company, 1924.

ANATOMIE HUMAINE, DESCRIPTIVE ET TOPOGRAPHIQUE. By H. Rouvière. Paris: L'Académie 1924.

THE NATIONAL HEALTH SERIES. Edited by the National Health Council: Exercises for Health, by Lenna L. Meanes, M.D. Assisted by Esse V. Hathaway; Home Care of the Sick, by Clara D. Noyes R.N.; Adolescence, Educational and Hygienic Problems, by Maurice A. Bigelow, Ph.D.; Your Mind and You, by George K. Pratt, M.D.; Health of the Worker, How to Safeguard It, by Lee K. Frankel, Ph.D.; The Child in School, by Thomas D. Wood, M.D. New York and London: Funk & Wagnalls Co., 1924.

INTERNATIONAL CLINICS. Edited by H. W. Catell, A.M., M.D. Philadelphia: J. B. Lippincott Company, 1924.

CHEMISTRY IN INDUSTRY. Edited by H. E. Howe. New York: The Chemical Foundation, Inc., 1924.

CANCER DE L'UTERUS. By Jean-Louis Faure. Paris: Octave Doin, 1924.

KOMPENDIUM DER GEBURTSHILFE. By Dr. Hubert Peters. Leipzig: Franz Deuticke, 1924.

GYNAEKOLOGISCHE PSYCHOTHERAPIE. By Dr. Med. W. Liepmann. Berlin: Urban & Schwarzenberg, 1924.

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The Red Stomach.—Jan Schoemaker.